INDIA RUBBER WORLD

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FEBRUARY, 1949

ANNOUNCING

CABOT'S HAF CARBON BLACK

Vulcan-3

AVAILABLE NOW IN CARLOADS

- *Fine Particle Size*
- *Superior Reinforcement*
- *Excellent Abrasion Resistance*

CABOT

GODFREY L. CABOT, INC.

77 FRANKLIN STREET, BOSTON 10, MASS.

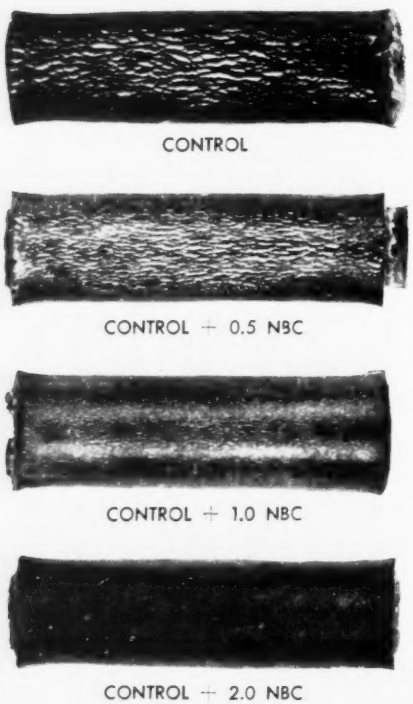
DU PONT ANNOUNCES

a valuable new compounding material

NBC

- ✓ Inhibits dynamic and static exposure cracking of GR-S
- ✓ Improves heat resistance of neoprene
- ✓ Retards sunlight discoloration of neoprene

CONDITION OF GR-S SIDEWALL STOCKS AFTER 56 DAYS' OUTDOOR FLEXING IN FLORIDA



CONTROL

CONTROL + 0.5 NBC

CONTROL + 1.0 NBC

CONTROL + 2.0 NBC

Now, with Du Pont NBC, GR-S compounds can be fortified against both static and dynamic exposure cracking. The illustration proves its effectiveness in a typical GR-S tread and sidewall stock. Even after 56 days of outdoor flexing, the stock with 2.0 parts of NBC showed no cracking. The control stock began to crack after only two days' flexing.

In neoprene stocks, which do not require protection against exposure cracking, NBC is important for other reasons: It is useful for improving heat resistance. And it effectively retards sunlight discoloration in colored compounds.

Compounders will find NBC an important ingredient for broadening the usefulness of both GR-S and neoprene stocks. Complete information on its use will be found in Report 49-1.

Extra copies are available. Experimental samples on request. See your Du Pont representative or write:

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Tune in to Du Pont "Cavalcade of America," Monday Nights—NBC Coast to Coast

India Rubber World, February, 1949, Vol. 119, No. 5. Published Monthly by Bill Brothers Publishing Corp., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $3.00 per year; Canada, $4.00. All Other Countries, $5.00; Single Copies 35 Cents. Address Mail to New York Office.

To serve you in new ways . . .

another EASY PROCESSING AMERICAN RUBBER

HYCAR OR-15 EP

THE new *easy processing* Hycar rubber has superior processing characteristics that parallel those of the widely used Hycar OR-25 EP. It retains the properties of the regular process Hycar OR-15 . . . permanent resiliency and superior resistance to oil, abrasion and aging.

In addition, Hycar OR-15 EP has these basic advantages:

1. Designed for Banbury and high temperature mixing.
2. Cuts mill mixing time appreciably.
3. Less rejections due to better mold flow and fusion during cure.
4. Improved building tack for laminated products such as rolls, sheet packing and hose.

Ask your supplier to tell you about, or investigate the merits of new Hycar OR-15 EP. Or, please write to Dept. HA-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Hycar
Reg. U. S. Pat. Off.
American Rubber

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Philology—*Love of learning.*

Philblack O—*the philological HAF black that applies itself to the job at hand.*

"Love to learn" about a sure-fire way to make better rubber products? Then here's the story! Philblack O, a high abrasion furnace black, imparts highly desirable qualities to rubber. To mention just a few—excellent flex life—remarkable durability under abrasion—increased resistance to cut and crack growth.

If you have some other specific problem, or if you'd like to find a method to make processing easy—just write for data on the results obtained with Philblack O.

PHILLIPS CHEMICAL COMPANY

A SUBSIDIARY OF PHILLIPS PETROLEUM COMPANY

EVANS BUILDING · AKRON 8, OHIO

A New Standard for Rubber Antioxidants

NAUGATUCK B-L-E-25

PROTECTS against Heat (natural rubber tread stock)

Aged 96 hrs. in air at 212° F.

Press Cure at 30 lbs.	No Antioxidant		1.5 B-L-E-25	
	Tens.	Elong.	Tens.	Elong.
45 Min.	1280	175	3700	495
60 "	1040	130	3520	465
75 "	880	125	3210	380
90 "	1100	135	3190	380

PROTECTS against Flexing

Flexing—Dumbbell Extension—Aged 24 hrs. at 212° F.

Press Cure at 30 lbs.	Kilocycles	
	No Antioxidant	1.5 B-L-E-25
45 Min.	270	332
60 "	225	342
75 "	182	368
90 "	155	287
TOTAL	832	1329

New Low Viscosity B-L-E-25 Insures Complete and Rapid Dispersion in all Rubber Compounds.
Write For Compounding Research Report No. 5.

PROCESS • ACCELERATE • PROTECT

with NAUGATUCK CHEMICALS

NAUGATUCK CHEMICAL

Division of United States Rubber Company

1230 AVENUE OF THE AMERICAS • NEW YORK 20, N. Y.

IN CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Elmira, Ont.

A New Year's Resolution readily kept and perpetuated:

Year after year, many of the country's substantial consumers specify ST. JOE ZINC OXIDES as a matter of course. While behind the preference thus indicated may be a variety of individual and specific reasons, their sum and substance can be expressed in plain, elementary language as follows:

The *consistent* high quality of St. Joe zinc oxides makes their continued use in the rubber, paint, ceramic and other industries a matter of sound business procedure.

ST. JOSEPH LEAD COMPANY *250 PARK AVENUE, NEW YORK 17, ELDORADO 5-3200*
Plant & Laboratory, Monaca (Josephtown) Pennsylvania

A new combination ....

Good-rite ERIE *plus* Good-rite VULTROL

.... that solves "scorch problems" in tire tread processing

NOW rubber compounders can utilize *all* the advantages of reinforcing furnace blacks in natural rubber tire tread formulations. And, it can be done *without* scorching—thanks to a new B. F. Goodrich Chemical Company development.

This new step forward in rubber compounding is a tested and proved combination of two rubber chemicals—Good-rite Erie and Good-rite Vultrol.

Good-rite Erie is an excellent delayed action accelerator, and Good-rite Vultrol is a highly effective retarder at processing temperature.

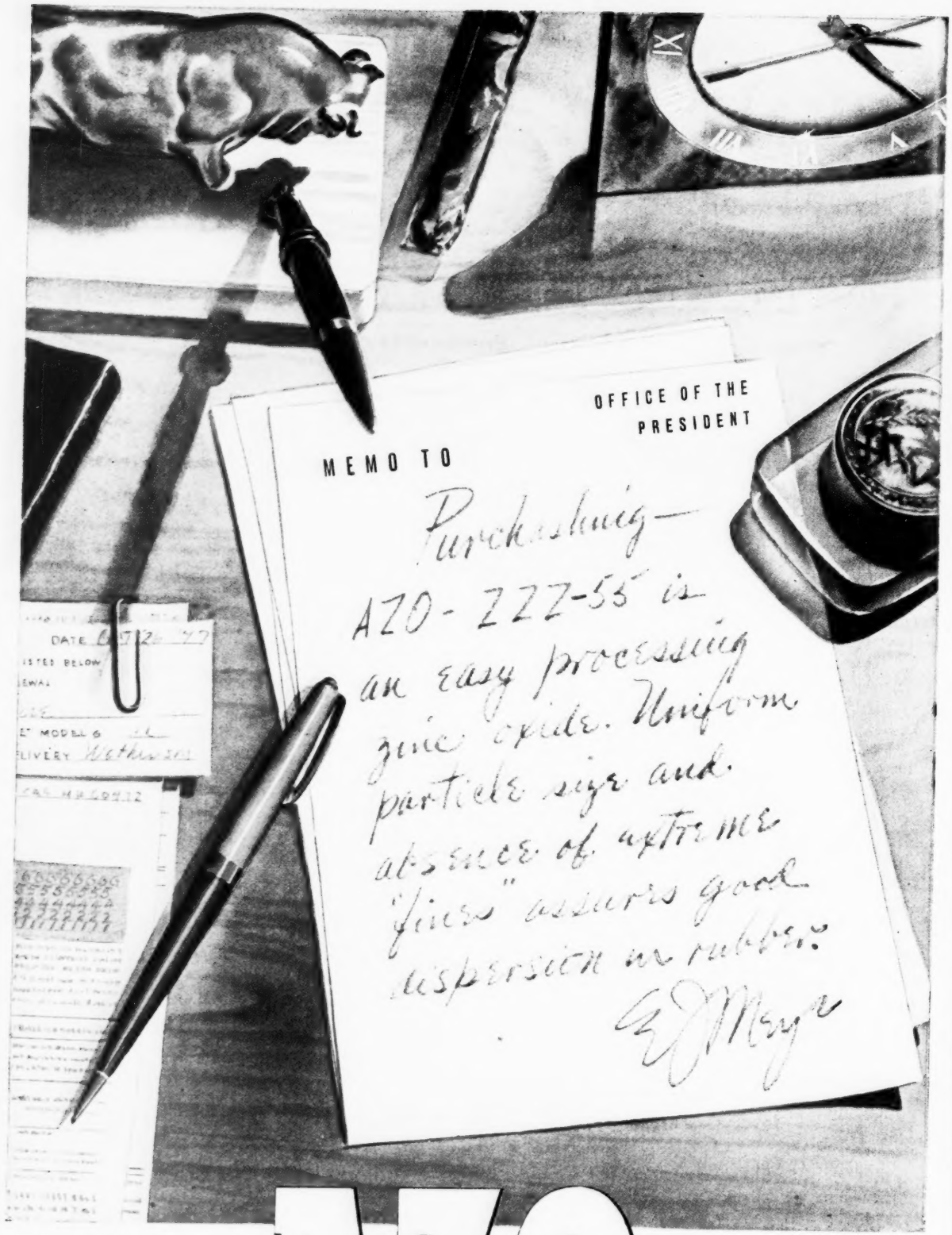
When they are properly combined, and used with reinforcing furnace blacks, here are the advantages gained:

1. Low heat build-up
2. Freedom from scorch
3. Good flex life and high abrasion resistance
4. Improved resilience and compression set
5. Easy handling and processing

For complete information on the properties and use of this new accelerator-retarder combination, please write Dept. CA-1, the B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers



Uniform-Dependable

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AMERICAN ZINC SALES CO.

Distributors for

AMERICAN ZINC, LEAD & SMELTING CO.

STABILITY . . . Marvinol VR-10 is superior in resistance to heat, light and other normally destructive factors.

VERSATILITY . . . Marvinol VR-10 is easy to process . . . may be calendered, extruded, injection molded, used in non-aqueous dispersions, formulated as unplasticized rigids . . . uniquely versatile.

TOUGHNESS . . . Marvinol's high molecular weight offers you extra toughness and "dryness" with long life . . . resists tear, wear, oils, acids.

. . . here's why industry is turning to MARVINOL® the unique VINYL RESIN

WIDER TEMPERATURE RANGE . . . Marvinol VR-10 assures you products that show less deformation due to heat . . . gives greater low temperature flexibility.

COLOR . . . Marvinol offers many opportunities for distinctive coloring . . . from clear to delicate or brilliant shades.

EASILY CLEANED . . . Marvinol-based products are easily and quickly cleaned because of their smooth surface. They're waterproofed, unaffected by mold or fungi.

The New Ultra-Modern Marvinol Plant contains the latest equipment to assure efficient operation, uniform production of the highest quality. Send today for details. Write on your company letterhead to Chemicals Division, Dept. I-2, The Glenn L. Martin Company, Baltimore 3, Maryland.

CLOSE COOPERATION . . . The Glenn L. Martin Co. compounds and fabricates only in its customer service laboratory for your benefit. We sell only raw materials. Our sales engineers and modern customer research laboratory are ready to help with your processing problems.

Martin ® Marvinol

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THE GLENN L. MARTIN COMPANY • AN INTERNATIONAL INSTITUTION

"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN"

Increase your PROFITS

...in the rubber industry... get these THERMALL Profit Builders!!

Increase Banbury output, save labor and power costs.

Shorten breakdown time on mills, save labor and power costs.

Improve compounding quality.

Improve molding quality and reduce curing defects.

Increase capacity of mixing on open mill by heating crude rubber and reclaimed rubber.

Cut curing time up to 50% and more.

Increase equipment life, reduce maintenance costs.

Break down ***Hard Stocks*** easier, faster, save labor and power costs.

Thermall equipment is extremely economical to operate.

Thermall Electronic Heating equipment generates heat right where it is wanted, ***"in the material itself".***

Thermall equipment will speed up checking materials in laboratory, such as mixed stock, checking for proper dispersion of pigments in rubber . . . checking of cord fabrics for moisture content . . . and all other types of materials.

SEE *THERMALL* DEMONSTRATED IN YOUR OWN PLANT WITHOUT OBLIGATION

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ELECTRONIC RUBBER HEATING

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WORLD

CARBON BLACKS

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

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View of elevators and storage for bag packing in one of our furnace units at Ryus, Kansas.

Why, Of Course!

A number of your compounds would be better if they contained more Dixie 20, the semi-reinforcing (SRF) furnace black, and, furthermore, you would have an added advantage in processing. Therefore, for maximum efficiency use Dixie 20 in more of your compounds.

Standardize on United carbon blacks. Their uniformity and high quality will contribute to the excellence of your products.

DIXIE 20

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston 27, West Virginia

For Extra Hardness
in Wringer Rolls

For Extra Go
in Golf Balls

Use PLIOLITE S-6

HERE you see how the use of **Pliolite** S-6 improves such widely different rubber products as clothes-wringer rolls and golf balls.

Add **Pliolite** S-6 to the compound and a wringer roll of excellent hardness and fine white color is insured.

Add this superb reinforcing agent to golf-ball cover stocks and you get the desired resiliency and cut resistance, as well as good click and long flight.

Pliolite S-6 is a superior colorless reinforcing material. It is well adapted to all compounds needing a light-color, low gravity stock of 70-100 durometer hardness with good processing characteristics and moldability. Its reinforcement is positive—coupling extra hardness with negligible loss in elongation. Often elongation is improved.

You'll find **Pliolite** S-6 to be effective with GR-S, Neoprene, Buna N and natural rubber. It is available as a powder for your own mixing, or in master batches in whatever rubber you select. For complete information and sample, write: Goodyear, Chemical Division, Akron 16, Ohio.

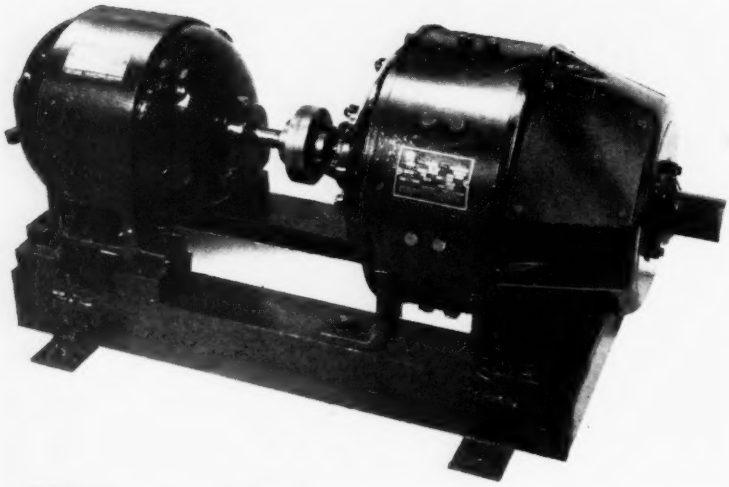
We think you'll like "THE GREATEST STORY EVER TOLD" Every Sunday—ABC Network

GOODYEAR

Pliolite—T.M. The Goodyear Tire & Rubber Company

A-C'S *BUYING GUIDE TO . . .*

GUARANTEED NEW AND REBUILT INDUSTRIAL ELECTRICAL EQUIPMENT



MOTOR GENERATOR SETS (Reconditioned and Guaranteed)

Qu.	KW	D.C. Volts	Make	A.C. Volts
2	2	125v	E.M.	220/440/3/60
5	5	250v	Reliance	220/440/3/60
5	5	250v	Reliance	220/440/3/60
5	10VS	Drives	Reliance	220/440/3/60
1	15	125v	Bogue	220/440/3/60
4	15	250v	G.E.	220/440/3/60
3	20	250v	G.E.	220/440/3/60
1	30	115v	Wise	220/440/3/60 Sq. Cg.
1	30	250v	G.E.	220/440/3/60 Sq. Cg.
2	50	250v	C-W	220/440/3/60 Sq. Cg.
1	60	125 or 250	Wise	440/3/60 (New-syn)
2	60	250v	C-W	220/440/3/60 Sq. Cg.
4	75	250v	C-W	220/440/3/60 Sq. Cg.
1	75	250v	Wise	220/440/3/60 Sq. Cg.
1	100	125v	A-C	4150/3/60 80% Syn.
1	100	125/250v	A-C	Any/3/60
1	100	250v	C-W	Any/3/60 Syn 100%
1	150	250/275v	G.E.	220/3/60 Sq. Cg.
1	170	125v	G.E.	2200/3/60 Sq. Cg.

D. C. CONSTANT SPEED MOTORS, 230 volts (Reconditioned and guaranteed except where shown New)

Qu.	HP	RPM	Make	Type
1	2	1725	Master	224 (New)
12	3	850/1700	Rel.	23T
5	5	520/1534	G.E.	CD95
1	$7\frac{1}{2}$	600/1200	E.D.	55
1	$7\frac{1}{2}$	850/1700	West.	SK63
1	25	1150	West.	SK105
1	30	850	Rel.	185T
1	40	850	G.E.	CD113
1	75	860	C-W	53H-TE

CONTROLS (new) D. C.

Qu.	Size	HP	Mfg.	Volts	Type
30	1	3	G.E.	115 or 230	CR 5230
3	1	5	C-H	230	Adj. Speed
4	2	10	A.C.	230	Contact Speed
3	2	10	C-H	230	Adj. Speed
2	3	10	C-H	230	Adj. Speed—Rev.
2	3	25	C-H	230	Adj. Speed
1	3	25	C-H	230	Adj. Speed—Rev.
1	4	40	C-H	230	Adj. Speed
1	4	40	C-H	230	Adj. Speed Rev.
2	5	75	C-H	230	Adj. Speed
1	6	150	C-H	230	Adj. Speed

D. C. ADJUSTABLE SPEED MOTORS 230 VOLTS (Reconditioned & Guaranteed)

3	3/5	1150/2850	Rel.	41T (New)
2	3/5	1150/3450	G.E.	284
1	3/5	450/1800	G.E.	CD-75
1	$5/7\frac{1}{2}$	500/2000	L.A.	ONW-851
2	$7\frac{1}{2}/10$	400/1600	G.E.	CD-85
3	$7\frac{1}{2}/10$	450/1800	Rel.	92T
1	$7\frac{1}{2}/10$	600/1800	Rel.	66T
1	10/15	400/1600	G.E.	CD-95
1	10/15	575/1725	L.A.	ONA-9005
3	10/15	575/2300	G.E.	CD-85
3	10/15	400/1350	Marble Card	
5	15/20	400/1200	G.E.	CD-105
1	20/25	400/1200	Electro Dyn.	208
1	25/30	400/1600	Rel.	262T (New)
3	40/50	250/1500	G.E.	CD1441
1	40/50	350/1050	West.	SK141
1	40/50	500/1500	Rel.	385T
1	50/60	300/900	Electro Dyn.	308
1	125/150	262/750	G.E.	MPC
1	135/175	450/1200	G.E.	MCP
1	200	300/900	West.	

MISCELLANEOUS

1. Falk Steelflex Couplings. Sizes 2F to 18F available for stock delivery.
2. New P & H Harnischfeger Zip Lift Hoists in stock. 250 to 2000 pound lift, 220, 440 or 550 volt motors.
3. New Robbins & Myers 5000 lb. Type S-3 BG Hoist, complete with hand geared trolley and totally enclosed motor, lifting speed 32 FPM, pendant type control.
4. Chandesson 5000 amp., 6 volt plating generator set with complete control, synchronous motor drive. 440-3-60.
5. 60 KW, 1500 amp., Anodizing M-G Set, 3/40 volts; any A.C. voltage, 3 ph, 60 cy. squirrel cage drive.
6. Electro-Products 120 KW, 3000 amp. Anodizing M-G Set, 3/40 volts with complete control and synchronous motor drive.

A. C. SQUIRREL CAGE MOTORS, 220/440 v., 3 ph. 60 cy. (New except where shown as "R & G")

Qu.	HP	RPM	MAKE	DESCRIPTION
1	200	1800	Al. Chal.	TE,440 v. 830BSZ
1	150	1750	Al. Chal.	R & G
1	150	600	Wstg.	CCL, R&G
1	125	1760	Al. Chal.	440 V. 623BS
1	125	1160	Al. Chal.	440 V. 626Ds
1	125	870	Al. Chal.	440 V. 626F
1	100	1760	Al. Chal.	440 V. 623AS
2	100	1160	Al. Chal.	440 V. 823ES
1	100	1160	Al. Chal.	440 V. 823E TEXP
1	75	1750	Al. Chal.	505S
1	75	1200	Al. Chal.	440 V. 823F TEXP
1	75	1165	Al. Chal.	505
1	75	865	Al. Chal.	623E
1	60	1750	Al. Chal.	444S
1	60	900	Al. Chal.	440 V. 823FZZ TEXP
1	50	3450	Ideal	R&G A-120
3	50	1750	Al. Chal.	445
3	50	1750	Lincoln	IL, 2300 V.
1	50	1750	Al. Chal.	445, TE
1	50	1200	REL.	C445
2	50	1200	Al. Chal.	505, TEXP
1	50	900	Al. Chal	505
1	50	900	Al. Chal.	823EZZ TEXP

We have a complete stock of motors at speeds of 900 to 1800 RPM in ratings below 50 Hp. Open, totally enclosed, and explosion proof motors available.

Slip Ring and Synchronous motors

Qu.	Hp.	RPM	Make	Description
1	250	600	Lincoln	220 v IXY, slip ring R & G
1	106KW	1200	Elec. Mach	Syn Gen 80% PF, single brg. R & G
1	50	900	Louis Allis	SR, with automatic controls R & G
1	150	1200	Al. Chal.	440 v. YS26ES SR
1	125	1200	Al. Chal.	440 v. S26D SR
1	125	900	Al. Chal.	440 v. YS26F SR
1	100	900	Al. Chal.	440 v. YS26E SR
1	75	900	Al. Chal.	440 v. YS23E SR
1	60	1200	Al. Chal.	505 SR
1	50	1200	Al. Chal.	504 SR
1	25	900	Al. Chal.	444 SR

CONTROLS (new) A. C.

Qu.	Size	Mfg.	Volts	Type
12	1	C-H	220-440-550	Combination
25	2	C-H	220-440-550	Combination
14	3	Clark	440-550	Combination
3	4	C-H	440	Combination
14	2	C-H	220-440	Reversing
2	3	Sq. D.	440	Reversing
3	4	C-H	440	Reversing

REDUCED VOLTAGE STARTERS

Qu.	H.P.	Mfg.	Volts	Type
10	15	C-H-G.E.	220-440	R&G
6	25	C-H	220	Primary Resistor-New
9	50	C-H	220-440	New and R & G
4	75	C-H	220	New
3	100	C-H	440	New
4	125	C-H	220	New
1	150	C-H	440	New
2	125	C-H	440	Primary Resistor—New

AUTHORIZED

DEALER

VARIABLE VOLTAGE CALENDER DRIVES

1 125KW 250v Wise. 200 HP 1160 RPM 2200/3/60 Complete with Exciter, all AC control and 100p circuit controller.

200HP 300/900RPM 250v DC Shunt Wound Motor.

1 150KW 250v DC G.E. 250HP 900 RPM 220/3/60 Complete with exciter, all AC control and loop circuit controller 135-175HP 450/1050 RPM Shunt Wound Motor.

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Flexibility for Vinyl Products...

Strength for Molded Goods

S/V Sovaloid C

cuts plasticizer costs... improves quality... will not migrate!

THANKS to a special low-cost plasticizer developed from petroleum, the use of versatile vinyl resins may now be extended to many items where price was formerly a limiting factor. Increased sales opportunities for processors are the result.

This plasticizer—S V Sovaloid C—costs only a fraction of the price of conventional plasticizers. In some cases it may be used as a total replacement of these more expensive chemicals. In others, it may be used as an extender of these chemicals.

Along with its low cost, S V Sovaloid C offers other special advantages. It adds greater tensile strength than other plasticizers and imparts excellent flexibility at normal temperatures. It is completely compatible with all vinyl compounds and *will not tend to migrate from the finished products.*

S V Sovaloid C is intended for use in producing flexible vinyl floor tiles, shoe soling, belting, stripping and other extruded and pressed vinyl products. Ask your Socony-Vacuum Representative for full details.

What's New in Petroleum for Rubber?

Low Temperature Flexibility . . . S/V Sovaloid L retards stiffening of Neoprene.

GR-S Plasticizers . . . S V Sovaloids H&W extend GR-S, process durable compounds.

Neoprene Softeners . . . S V Sovaloid N. No "blooming"—even with large amounts.

Sun-Check Wax . . . S V Petrosene C prevents surface cracking.

GR-N Plasticizer...S V Sovaloid C. Fully compatible with all grades of GR-N.

Sponge-Rubber . . . Special Petroleum Emulsions assist manufacture of Neoprene sponge.

Process Products

SOCONY-VACUUM OIL CO., INC., 26 Broadway, New York 4, N.Y., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

Socony-Vacuum Process Products

NOW- you can improve your latex products these 5 ways...

1. Strengthen Adhesion
2. Increase Wear Resistance
3. Increase Modulus
4. Increase Tensile Strength in Saturated Paper
5. Decrease Water Sensitivity

Read these facts about New Du Pont LUDOX®

COLLOIDAL SILICA

No matter what type of latex products you make, the chances are that "Ludox" can help you expand your markets with *new* or *better* products.

For broader use with maximum economy, "Ludox" comes to you as a 30% colloidal solution of almost pure silica particles, less than 1/1,000,000 inch in size. Here are a few examples of what it can do for you:

ADHESIVES: "Ludox" strengthens—up to *three* times—latex adhesion to a wide variety of surfaces, including fabric, leather and metal.

FILMS AND COATINGS: Greatly increased modulus, abrasion resistance and reduced water sensitivity can be obtained when "Ludox" is added to synthetic latex compositions.

THREAD: Relatively small amounts of "Ludox" nearly double the modulus of neoprene thread.

SATURANTS: In neoprene-saturated paper. "Ludox" increases tensile strength up to 51.5%, abrasion resistance up to 41%, and internal bond strength 49%.

FOAM: In neoprene foam approximately 20% less sponge solids are required to obtain a given modulus—with no adverse effect on flex life, bend flex and compression set.

IN ADDITION, other ways of applying "Ludox" profitably in the rubber field are being developed. *How can "Ludox" help you?* A Du Pont Technical Representative will be glad to visit your plant and study your problems.

Get These Helpful Facts. *Clip the coupon below for the latest Technical Bulletin on "Ludox" for latex products.*

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Colloidal Silica

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...THROUGH CHEMISTRY

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Please send me latest Technical Bulletin on "Ludox" for latex.

Name_____ Title_____

Company_____

Address_____

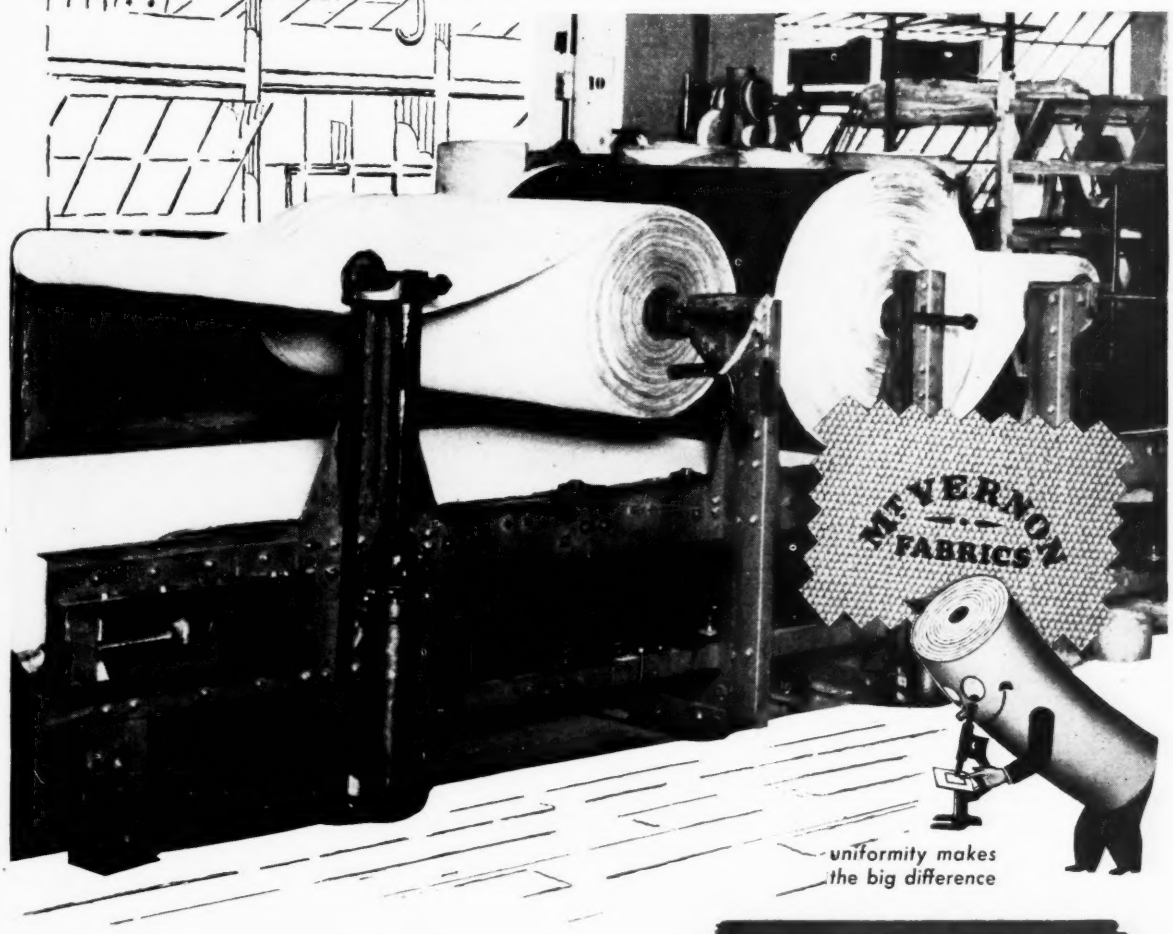
City_____ State_____

Interested in "Ludox" in_____
(*Type of product or products*)

The Fabric in Fabrication Means More when it's a Mt. Vernon Fabric

Produced under rigid laboratory controls to a high degree of uniformity, Mt. Vernon fabrics assure easier fabrication—more uniform rubber products.

For fabrics that provide greater strength, more uniform penetration and resiliency — that make your production problems easier — that add quality to your products — specify Mt. Vernon.



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Indispensable TO YOU IN THE RUBBER INDUSTRY—

Gives Your Products

PROTECTION and SALES APPEAL

at Little Cost!

BEACOFINISH—a unique family of coating materials conceived to give your products greater durability and eye appeal. These highly concentrated wax emulsions that can be diluted with up to four parts of water can be used with the utmost safety and economy.

BEACOFINISH is therefore of four-fold importance to you:—

1. ***It Protects*** your products against their natural enemies—air, sunlight, moisture and excessive handling.
2. ***It Improves*** the appearance of your product for its uniform coating stimulates greater consumer interest.
3. ***It's Economical*** because its high dilution potential (without losing efficiency) allows one gallon to cover 15,000 sq. ft.
4. ***It's Safe*** being a wax in water emulsion, it eliminates the fire and health hazards of volatile-solvent based finishes.

BEACOFINISH can be applied by dipping, sponging, spraying or brushing—dries in about 20 minutes—faster if force-dried—to give a hard protective coating of great elasticity.

BEACOFINISH may be ordered in Neutral or Black, in varying degrees of luster from brilliant to dull. It is so concentrated, from one drum you can obtain potentially up to five drums of superior coating for your products.

CONSULT US—WRITE US TODAY

Let us show you how BEACOFINISH can make your products more attractive and saleable—protect them from damage—you from loss—in production and transit!

THE BEACON COMPANY
Chemical Manufacturers
PURITY · UNIFORMITY · DEPENDABILITY
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In Canada: PRESCOTT & CO., Reg'd.
774 St. PAUL ST. W., MONTREAL

New ALBALITH-73 (LITHOPONE)

BEST for ALL Types of Rubber Compounds

Send for Samples

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET • NEW YORK 7, N. Y.

Whittle off Your Production Cost

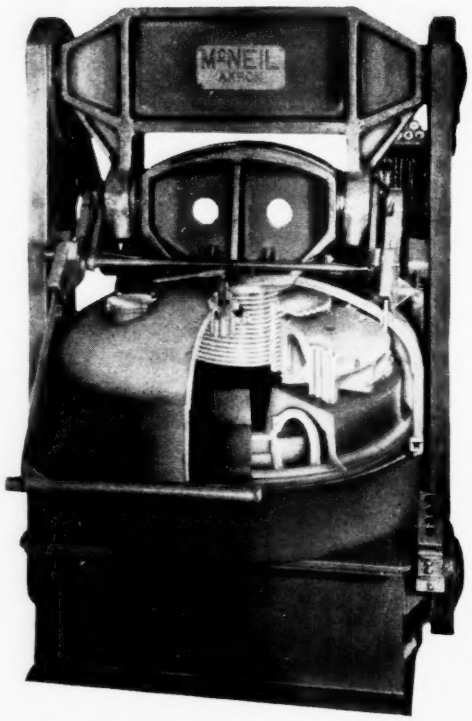
With McNEIL TIRE CURING EQUIPMENT

1 Labor and power saving. Our patented method for stripping any size of tire takes most of the work out of the job. One man can operate a large battery of presses. Very little power is required, as our electrically operated unit requires power for only a few seconds during each cycle, to open or close the press.

2 High production, resulting in lower costs due to almost continuous curing. One-half minute to two minutes for changes, depending upon size of tire being cured.

3 Wide range of flexibility and fast mold changing. Simple and rugged design of mechanism for adjustment to suit mold thickness.

4 Better cures, because of open steam method of curing, plus individual temperature and pressure control; plus cooling if desired. All presses are heavy duty type for high internal pressures.



Model 675-65"-18D Single

All the experience and engineering skill of the McNEIL organization is at your call to help you increase efficiency and speed while lowering production costs. For tomorrow's production, check with McNEIL today.

MANUFACTURING AGENTS — GREAT BRITAIN—Francis Shaw & Co. Ltd., Manchester, England
AUSTRALIA and NEW ZEALAND—Chas. Ruwolt Proprietary, Ltd., Victoria, Australia.

THE McNEIL MACHINE & ENGINEERING CO.

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RUBBER WORKING MACHINERY • INDIVIDUAL CURING EQUIPMENT FOR TIRES, TUBES and MECHANICAL GOODS

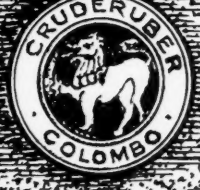
As experienced shippers of all grades and types of Natural Rubber and Sole-Crepe, we place the resources of our Company at your disposal. Would you be so good as to remember us when you again need supplies. Indeed, we shall esteem it a favour to furnish you with firm quotations by telegram.

Ceylon Produce & Rubber Company

69 Maliban Street

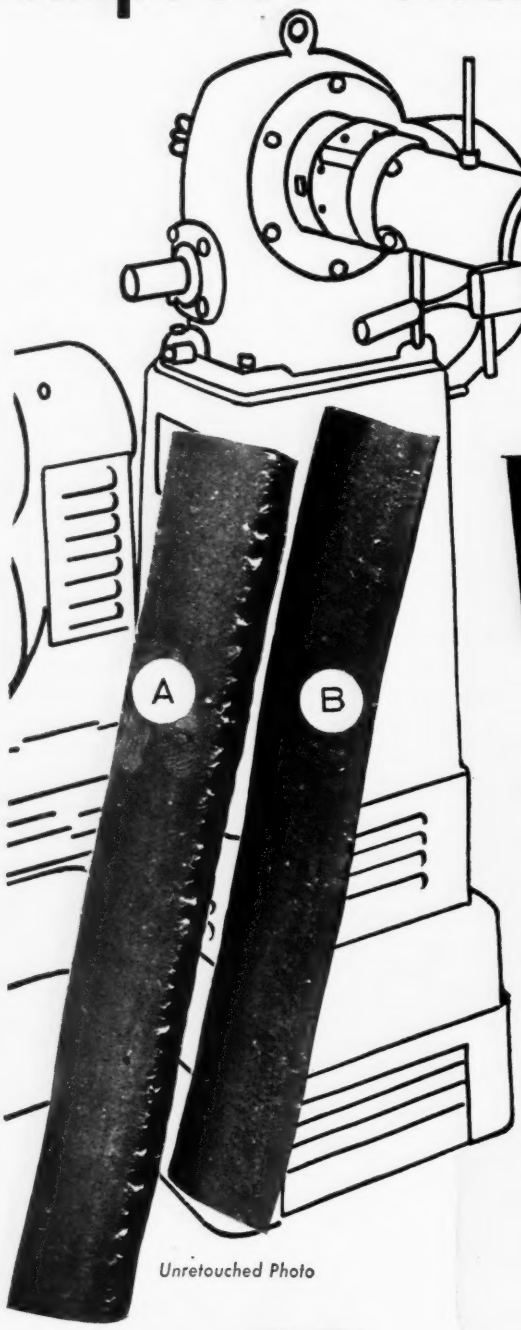
Columbo 11.

Cable Address: "Cruderuber" Colombo



CEYLON PRODUCE & RUBBER CO

improve extrusions



Unretouched Photo

Increase Processing Capacity *with* *Plasticizer* VISTAC #1

You can depend on Vistac #1 to promote smoother extrusions. In illustration at left, note the graphic difference in the quality of extrusion between Compound A (plasticized with 10% petroleum type softener) and Compound B (plasticized with 10% Vistac). The pictures give visual proof of the effectiveness of Vistac #1.

And In Addition VISTAC #1

- **Promotes finer finish — higher gloss**
- **Increases rate of extrusion, thereby increasing processing capacity**
- **Maintains dimensional stability**
- **Aids breakdown prior to extrusion**
- **Improves flex resistance**
- **Inhibits surface blooming**
- **Does not discolor white or light-colored stocks**
- **Improves serviceability of low-cost articles**

Physical Properties

Specific Gravity	0.900
Pounds Per Gallon	7.5
Color	Almost Water-White
Saybolt Univ. Visc. (210°F.)	2800+ secs.

Write for our new booklet on the use of Vistac #1 in Natural Rubber and GR-S

Advance SOLVENTS & CHEMICAL CORP.

245 Fifth Avenue • New York 16, N. Y.

The design and manufacture of processing rolls has been a highly specialized division of our business for more than 30 years.

Close co-operation with industry has given us an intimate knowledge of production problems and enabled us to make many important contributions to the development of modern, more efficient processing machinery.

When you are in need of roll renewals or are ready to specify for new processing equipment, consult us. Our engineering experience and production facilities are at your service.

UNITED ENGINEERING AND FOUNDRY COMPANY

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Plants at Pittsburgh, Vandergrift, New Castle, Youngstown, Canton

Subsidiary: Adamson United Company, Akron, Ohio

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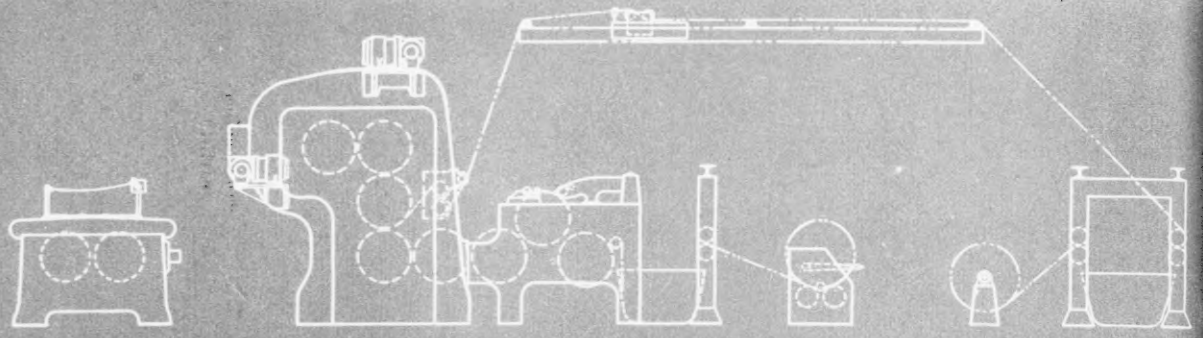
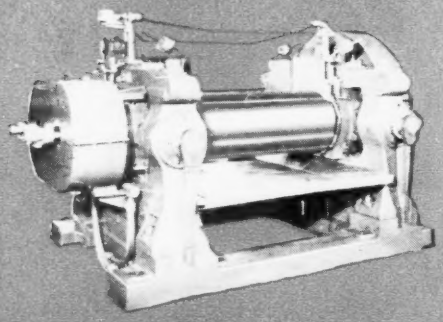
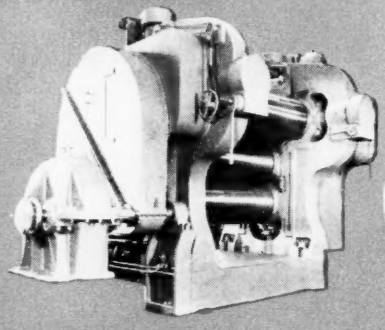
Engineered Equipment
for Continuous Processes



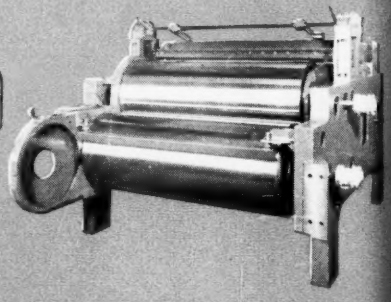
Continuous Calendering Process for supported or unsupported plastic sheet. Equipment includes fabric let-off stand with accumulator scray, fabric centering device, fabric pre-heating rolls, four-roll Calender, cooling rolls, and fabric wind-up with accumulator scray. Also included are facilities for trimming and winding up unsupported sheet. A stock warming up Mill is included, with stock transfer feeding conveyors as required.



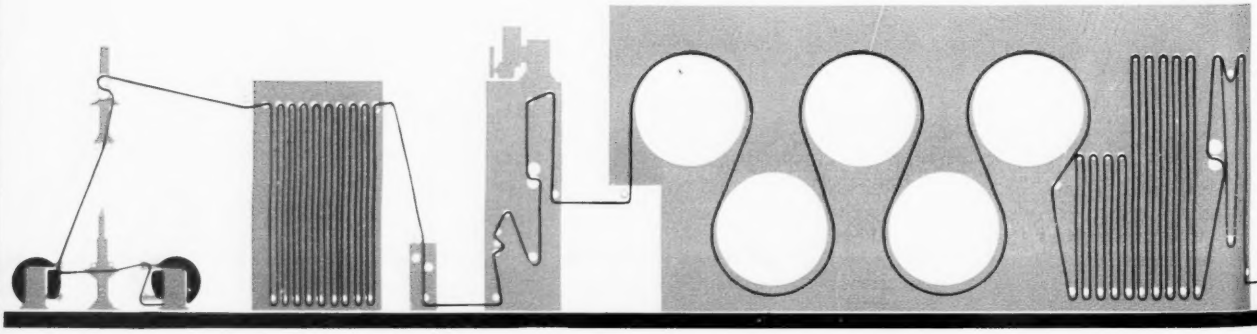
Warming and mixing Mill for plastics, 22" and 22" x 60", equipped with oil flood lubrication system, high pressure rotary joints, and tiltable stock guides.



Four-roll Calender for plastics, 24" x 68", including oil flood lubrication system, bored rolls, adjustable stock guides, high pressure rotary joints, motorized two-speed roll adjustment, and hydraulic roll stabilizing equipment.



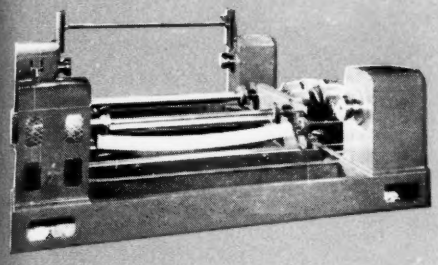
Film and Fabric Cooling Roll Unit, with film trimming and wind-up device for mounting at the Calender.



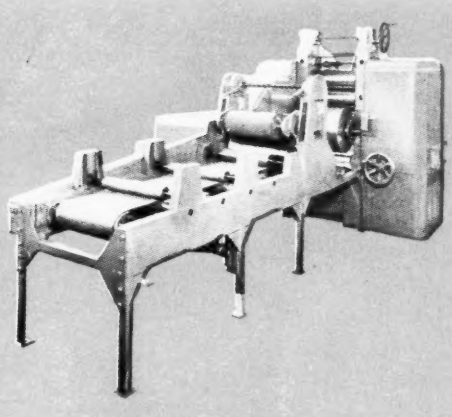
Continuous tire fabric processing unit, including pre-dipping, drying, calendering, cooling, and wind-up equipment.

We engineer, build and install continuous processing equipment for the manufacturer of rubber or plastics products. Your inquiry concerning special or unusual requirements is invited. Our engineers are available for consultation.

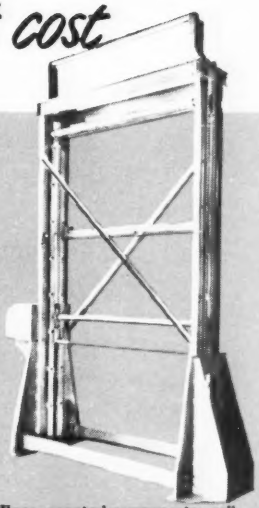
Improve product quality–lower product cost



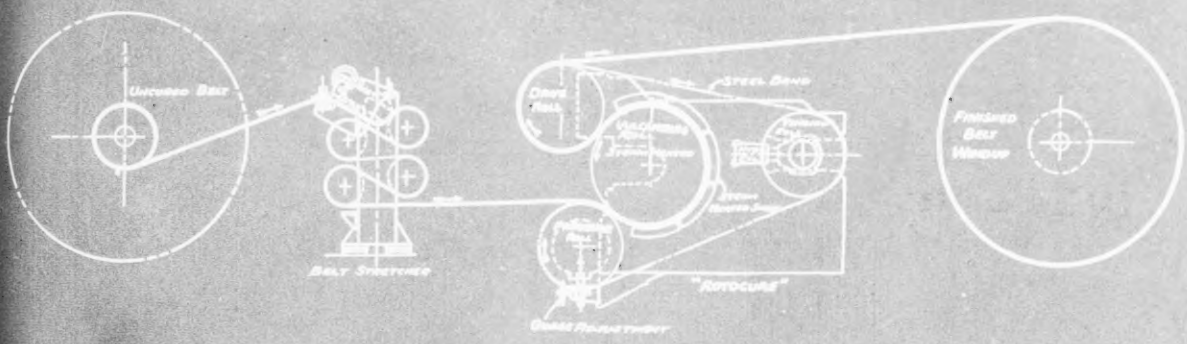
Unit for winding rubber sheeting on curing drums. Included are motor drive, stock let-off stand with liner wind-up and fabric let-off stand.



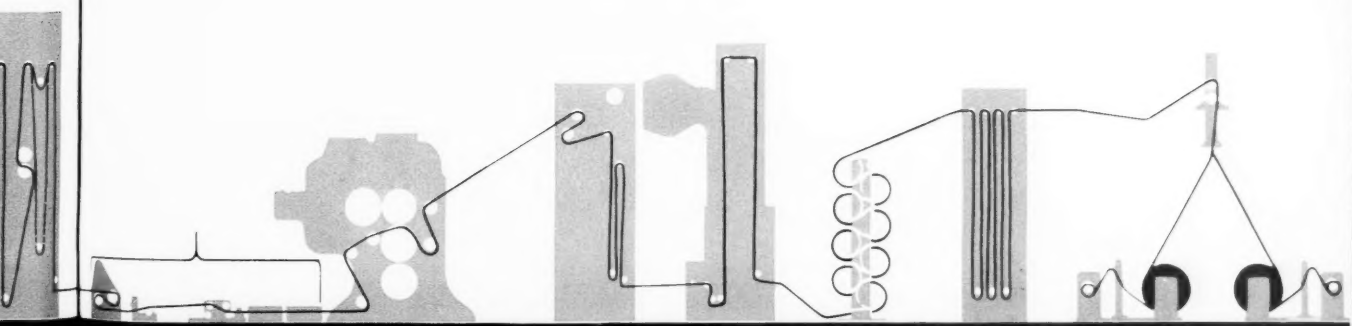
Combination Cooling, Slitting and Double Wind-Up Equipment for plastic film for use with four-roll Laboratory Calender.



Floor-mounted compensator roll stand used for coordinating the speed of machines in a continuous fabric processing installation.



"ROTOCURE" process for continuous vulcanization of belting and floor matting. The stretcher is not used when running matting. Built under license from Boston Woven Hose & Rubber Company.



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Yes, there are standard mills . . .

STANDARD MILLS*

Size Rolls	Approximate Capacity lbs. per Batch	Motor HP	Motor RPM	Floor Space Length	Floor Space Width	Drive Roll RPM	Roll Surface Position
6" x 13"	1¼ to 2	7½	190	3'6"	3'0"	30 to 35	0 to 1½
8" x 16"	2½ to 4	10-15	190	5'6"	4'0"	25 to 30	0 to 1½
10" x 20"	5 to 8	15-20	190	6'0"	4'0"	30 to 35	0 to 1½
12" x 24"	10 to 18	30-40	190	8'6"	5'0"	30 to 35	0 to 1½
14" x 30"	20 to 30	40-50	600-720	12'9"	6'6"	30 to 35	0 to 1½
16" x 42"	30 to 50	60-75	600-720	16'0"	8'0"	20 to 25	0 to 1½
18" x 48"	45 to 70	75-100	600-720	18'6"	8'6"	20 to 25	0 to 1½
22" x 60"	75 to 125	125-150	600-720	23'0"	10'6"	20 to 25	0 to 1½
24" x 72"	125 to 200	150-200	600-720	25'0"	12'6"	18 to 20	0 to 1¼
26" x 84"	150 to 250	150-200	600-720	26'0"	12'6"	15 to 18	0 to 1¼
28" x 84"	175 to 300	200-250	600-720	26'0"	14'0"	14 to 17	0 to 1¼

Because Farrel-Birmingham has been supplying *designed-for-the-job* mills for so many years, some purchasers probably do not even realize there are such things as *standard* mills.

The machines in the accompanying table are the sizes in greatest demand today. While listed as "standard", these mills can be modified or fitted with attachments to meet your needs. Method of cooling the rolls, lubrication, type of adjusting screws, design of guides, strip cutters, etc., are all supplied to fit the job requirements.

When you need a mill to fit into your production setup exactly, call on Farrel-Birmingham engineers for recommendations. Special sizes and variations in design, as well as a wide choice of drive arrangements, are obtainable.

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Plants: Ansonia and Derby, Conn.; Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston.

*Figures are approximate and will vary with individual conditions. Information for specific applications on request.

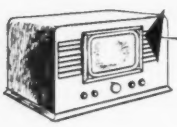
Rear view of standard 26" x 84" mill with force-feed lubrication and reduction gear unit for 200 HP individual motor drive.

FB-505

Farrel-Birmingham

TITANOX-A

improves the Rubber Mask that improves the Video picture



This rubber television mask acts primarily as a shock absorber, of course. Yet experience has shown it actually improves the visibility of the video picture.

In the mask, as in many other rubber products, TITANOX-A (titanium dioxide) contributes high reflectance and *lasting* whiteness.

Whether the natural or synthetic rubber you compound is for television masks or white sidewalls . . . colored bathing caps or bright beach balls . . . you can depend upon TITANOX titanium dioxide or composite titanium calcium pigments to impart the desired degree of whiteness or clarity of tint . . . brightness . . . complete opacity or controlled translucency.

You are always welcome to discuss with us your problems in white pigmentation of rubber. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; 104 So. Michigan Ave., Chicago 3, Ill.; 2600 So. Eastern Ave., Los Angeles 22, Calif. Branches in all other principal cities.

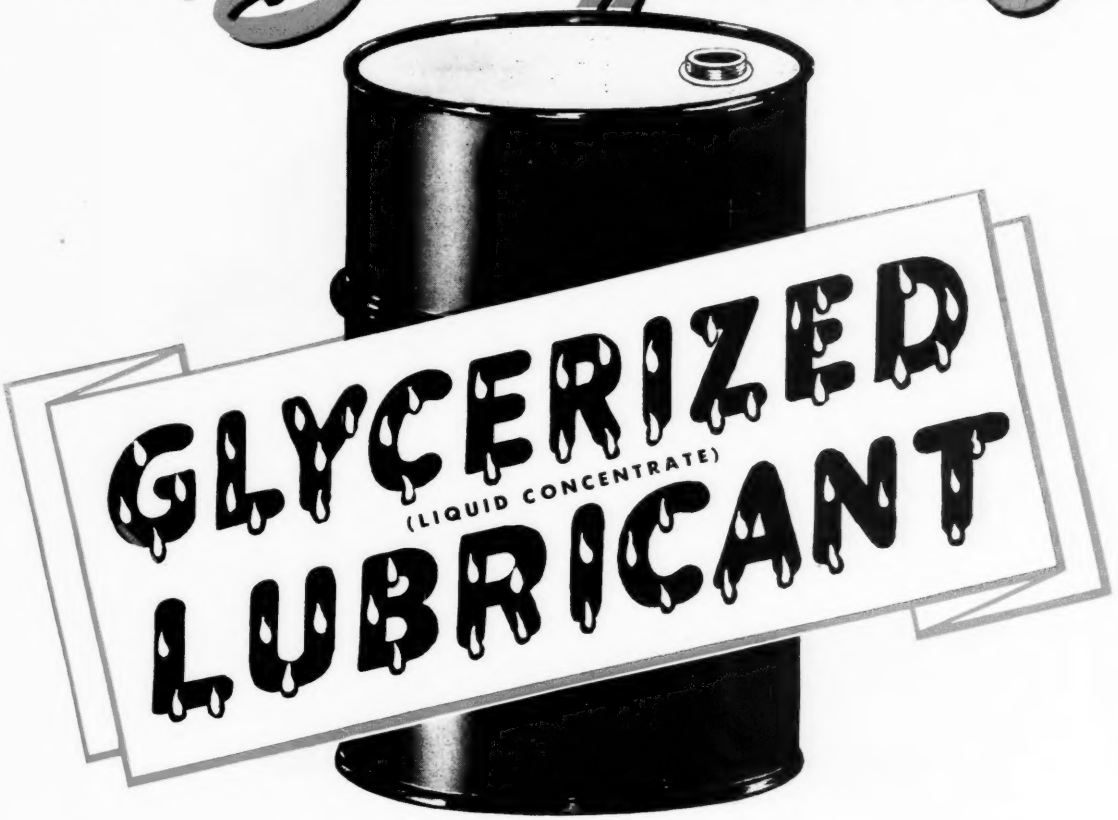
® TITANOX

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

Serving the RUBBER INDUSTRY ✱ with Satisfaction



Prevents adhesion of hot rubber slabs when piled . . . banishes dust nuisance by replacing soapstone or talc . . . prevents sticking during cure of extrusions and flat pan coiled tubing . . . excellent release agent for molds, mandrels, air bags, belt drums . . . equally satisfactory for washing and finishing inner tubes; imparts satiny finish . . . greatly aids in the processing of insulated wire and cable. The Production Departments and Laboratories of many rubber manufacturers, through years of using GLYCERIZED, give ample proof of its outstanding qualities as a lubricant for natural, synthetic and reclaimed stocks.

Also Mfgrs. of

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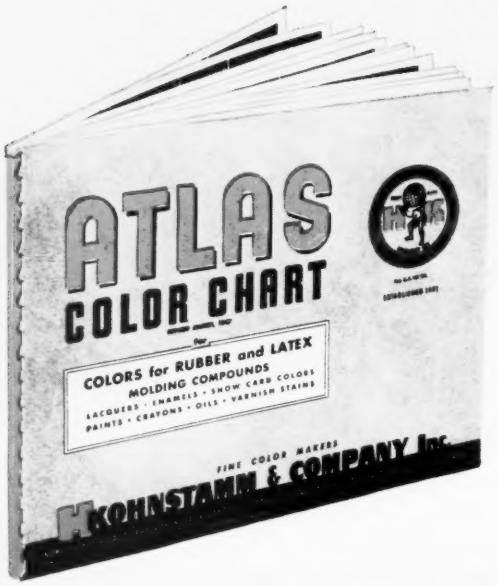
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A complete line of ORGANIC PIGMENTS for RUBBER, LATEX and RUBBER REPLACEMENTS. All colors are checked for performance under PRESS CURE—OPEN STEAM—ACID CURE—SOAP WASH—and resistance to HYDROCHLORIC ACID.

Bright, uniform, appealing colors suitable for AMMONIATED LATEX are also available.

Your inquiries are invited. Tell us what your special problems are—and we shall be glad to make recommendations and submit samples.

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NATURAL RUBBER
PLASTICS

T-C

CABLE ADDRESS
"COSTAN" AKRON
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Importers of Natural Rubber

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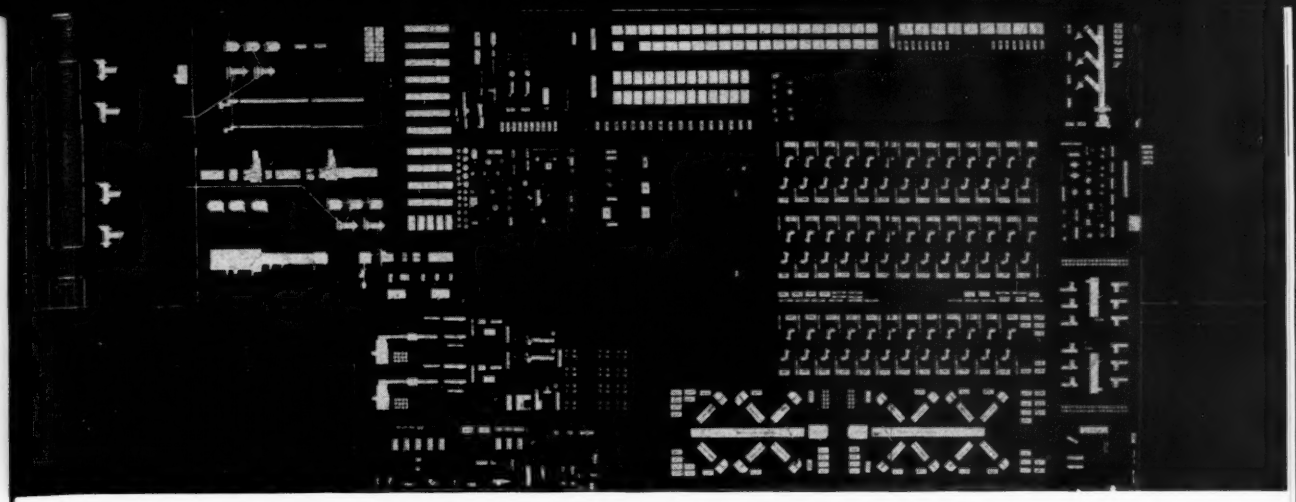

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They furnish any or all of the following services for projects of any size:

- Operation Analysis
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- Plant Layout
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- Purchase Recommendations
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GIFFELS & VALLET, INC.

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RECLAIMED RUBBER

Can Save $100 on Mixing Costs for Somebody

This is a stack of reclaimed rubber. It is also a stack of pre-mixed compound. Besides rubber it contains carbon black, zinc oxide, and other ingredients.

Its liberal use will show worthwhile savings in mixing.

These savings are in addition to the material cost savings accompanying the use of reclaimed rubber.

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PEQUANOC RUBBER CO.

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Exclusive Sales Representative

in the United States

for the Sale of Natural Rubber Latex

prepared by

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The plantations they manage have always been noted for the careful preparation of their product and the H. & C. mark has long enjoyed a world-wide reputation for reliability. The establishment of H. & C. Latex Ltd. with the most up-to-date equipment, under the supervision of a staff of experienced rubber chemists and engineers, should therefore be welcomed by all users of Natural Rubber Latex, who can be assured of a high quality and uniform product.

Centrifuged and Normal Latex of high quality can be supplied promptly in tank cars and smaller quantities at competitive prices.

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Suite 1803, 347 Madison Ave., New York 17, New York, Murray Hill 4-1161
525 Washington Highway, Buffalo 21, New York, University 3800
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Export Agent:

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...for RUBBER

...for PLASTICS

WATCHUNG REDS

RT-428-D — FULL STRENGTH

RM-417-D — EXTENDED FORM

They exhibit excellent brilliance and light fastness. Non-bleeding, they also have good resistance to soap, hot water and rubber curing. Both types are brilliant, medium-shade reds which are easily dispersible in rubber. Excellent for the production of quality products.

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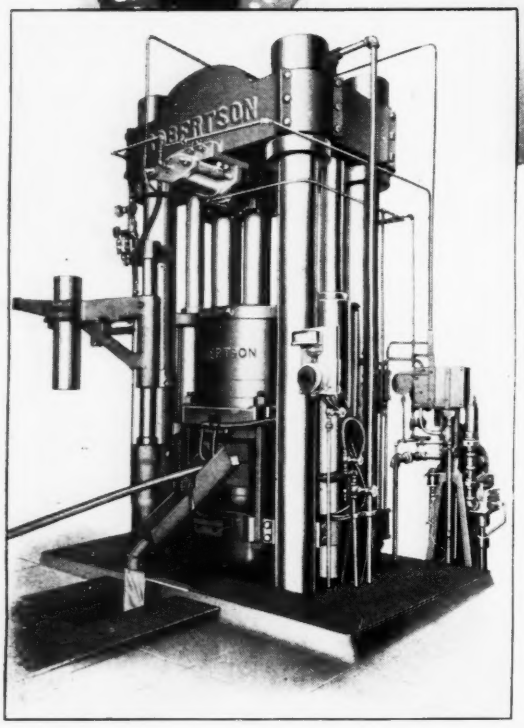

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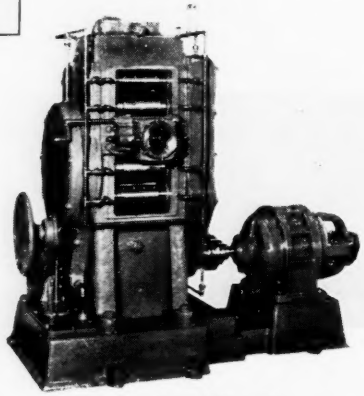
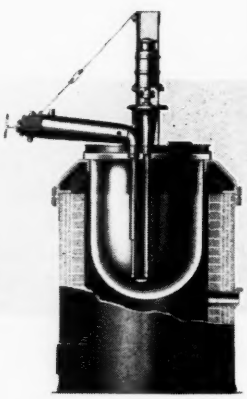


Lead Sheath Stripping Machine



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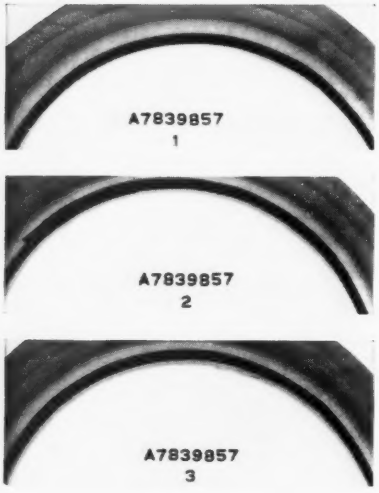
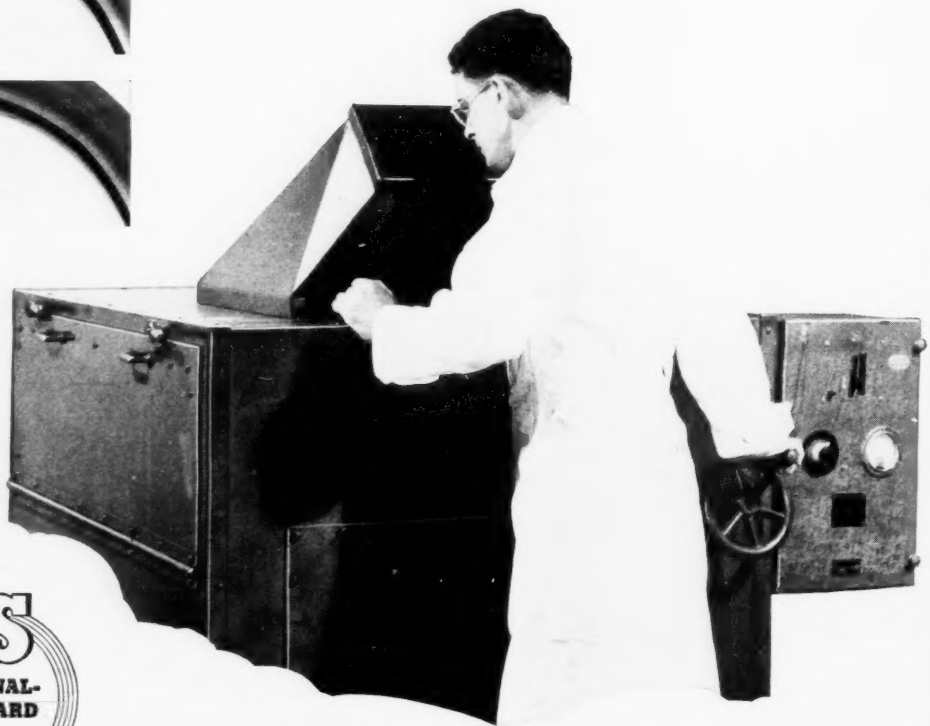


National-Standard fluoroscope provides for either visual study or, as shown here, a photographic record of a complete tire in three sections.



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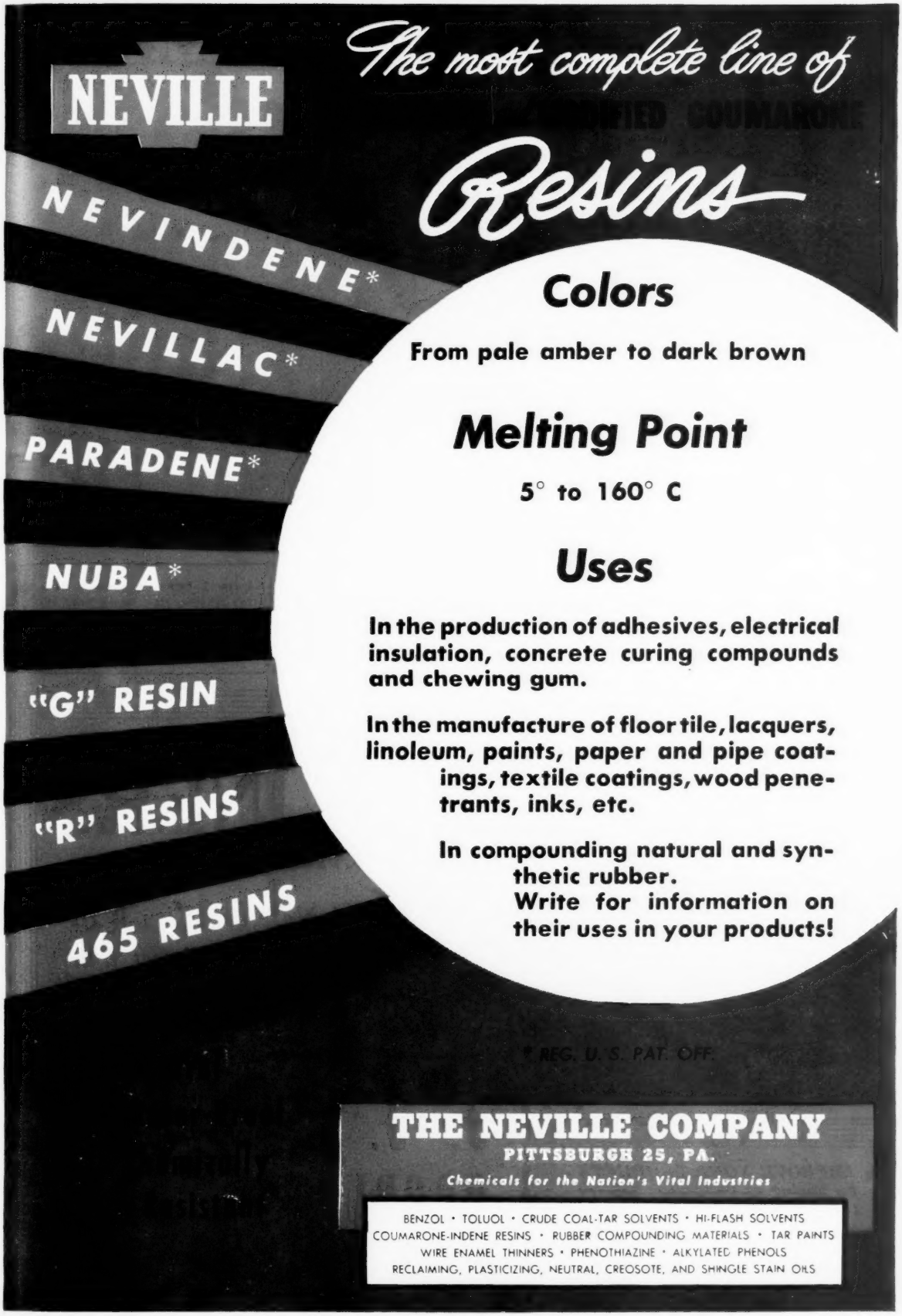
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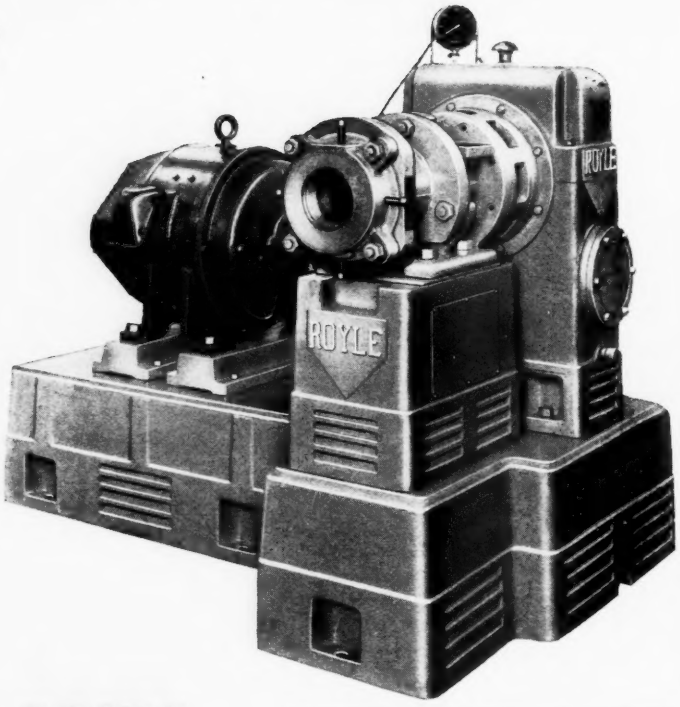

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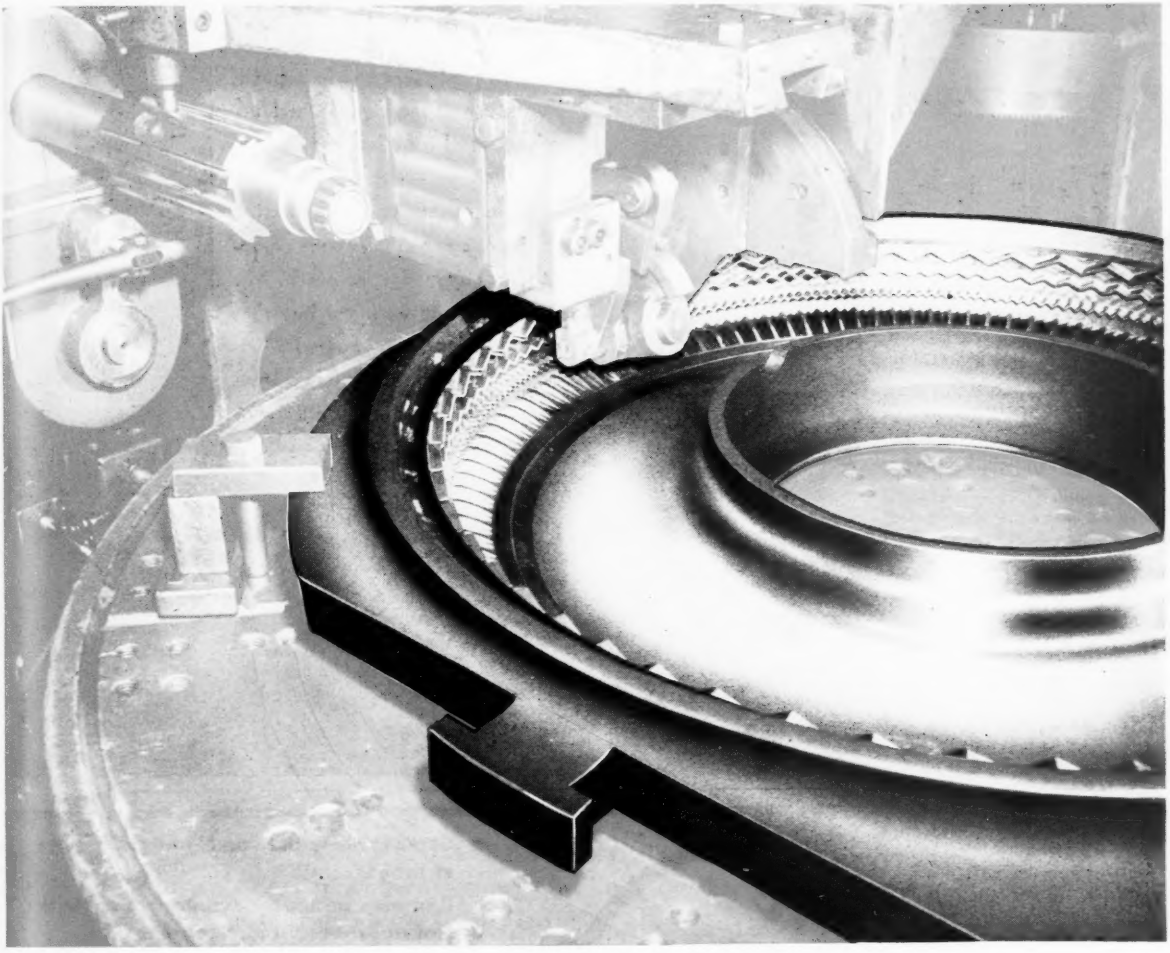

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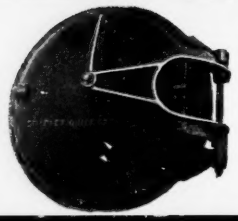

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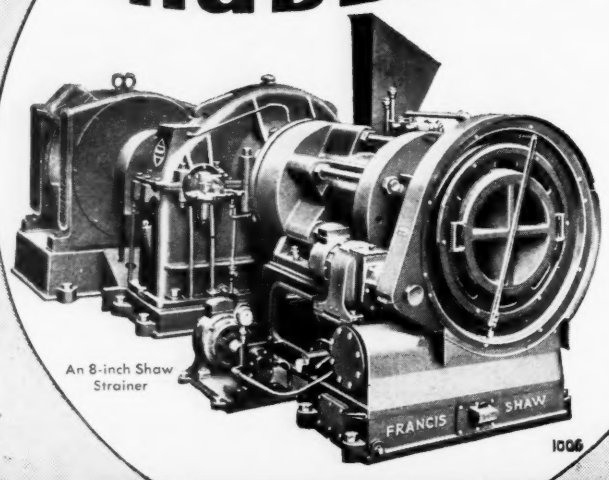

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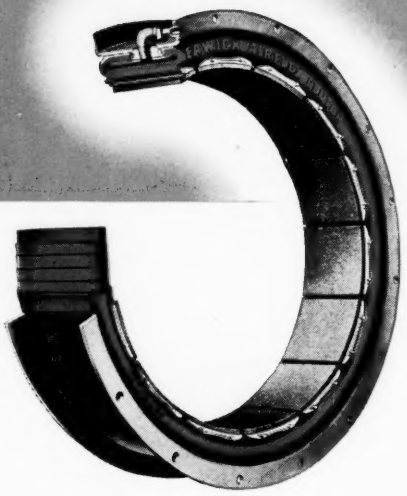
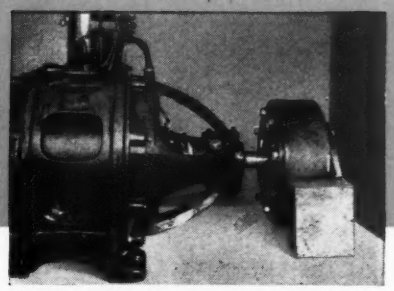
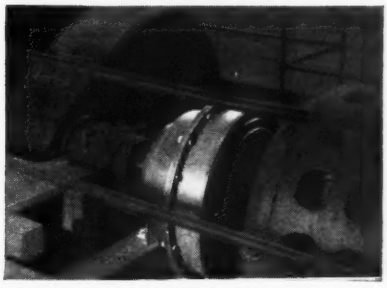


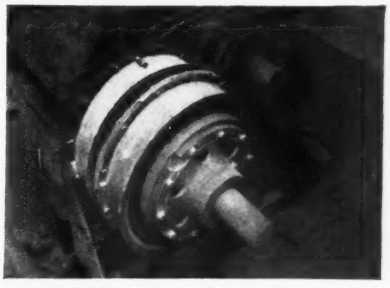
Fawick Airflex Clutch or Brake Type CB



Fawick Air-Ring Brake on a 42"x18" Farrel Calender at Crown Rubber Co., Fremont, Ohio.



Fawick Airflex Clutch and Brake on Rubber Mill drive at Rome Cable Co., Rome, N. Y.



Fawick Airflex Clutch and Brake on two Allen Mills at Haartz-Mason, Inc., Watertown, Mass.

The rubber-and-fabric pneumatic tube faced with friction shoe assemblies is the only moving part in this Fawick Clutch. This part naturally stays in perfect adjustment at all times—automatically compensating for wear of the friction shoes.

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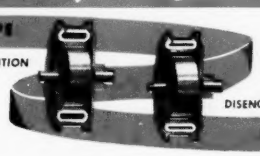

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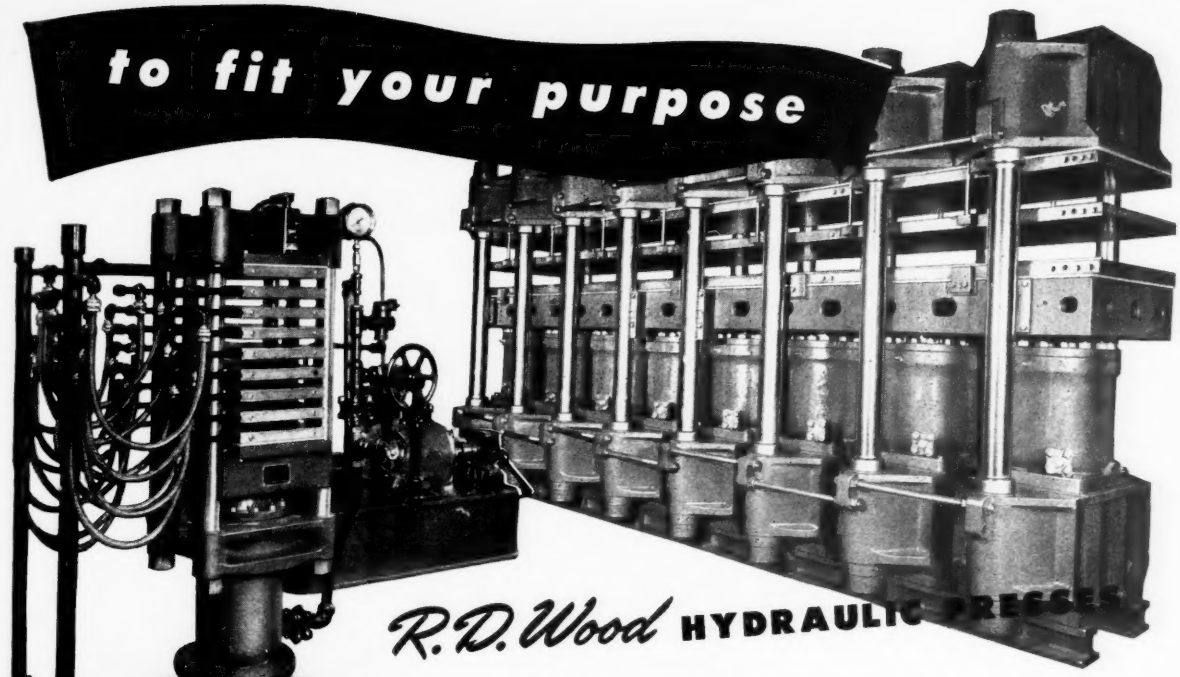

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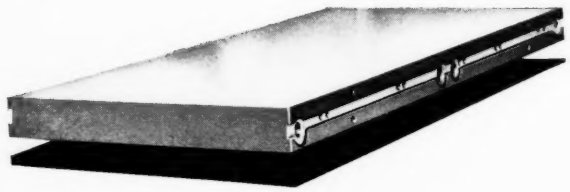

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February, 1949

Volume 119 Number 5

A Bill Brothers Publication

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RUBBER WORLD

Volume 119 New York, February, 1949 Number 5

Applications of High-Tenacity Rayon in the Rubber and Plastics Industries[1]

D. Finlayson[2] and T. Jackson[2]

"FORTISAN" is the registered trade mark of a "Celanese" strong yarn which is the basic material used for the construction of a wide range of textile products—yarns, woven and knitted fabrics, braids, ropes, and cordage—all of which are distinguished by their exceptionally high strength in relation to their weight.

It is well known that "Celanese" is prepared by the action of acetic acid and acetic anhydride on purified cellulose. The resultant cellulose acetate is dissolved in acetone and spun into filaments which are then grouped together to form a thread of yarn. This thread is then stretched and saponified for the production of "Fortisan."

Stretching has the effect of alining all the molecular chains of which the material is composed in the direction of the length of the yarn, and saponification results in the reconversion of the cellulose acetate to cellulose, for which reason "Fortisan" is classified, chemically, as "regenerated cellulose."

This chemical classification includes other textile materials such as viscose and cuprammonium, but, though "Fortisan" resembles these materials chemically, it is very different physically, a result of the special methods of preparation, which have the effect of bringing the molecular chains into more complete alinment and more intimate contact with each other than is found practicable with other methods of preparing yarns of regenerated cellulose.

Thus "Fortisan" occupies a position among yarns and fibers made from regenerated cellulose similar to that occupied by flax among fibers formed from natural cellulose. This point is illustrated in Figure 1, which shows X-ray photographs of "Fortisan," "Durafil," and viscose on the left, and flax, hemp, and cotton on the right. The former have the structure of regenerated cellulose, and the latter that of natural cellulose, but it will be seen that, to a casual glance, the X-ray photographs of each group differ more among themselves than one group differs from the other. The reason is that differences due to the degree to which the molecular chains of cellulose are alined along the axis of each fiber are much more obvious on the X-ray photographs than are differences due to the sideways arrangement of the molecular chains with respect to each other; the latter is the main structural distinction between regenerated and natural cellulose. A fiber in which all the chain molecules lie closely parallel to the axis of the fiber shows an X-ray pattern localized in discrete spots; while if the chains are only imperfectly alined, as in viscose, or have a spiral formation, as in cotton, the spots are spread into broad arcs.

It is now well known that for each type of fibrous material there is a general correlation between fiber strength and perfection of orientation, and it is only to be expected, therefore, that the order of strength of the materials listed in Figure 1 should be in accordance with their differences in orientation. Table 1 shows in tabular form representative values of the tensile strengths of the materials referred to in Figure 1. The results are given as tenacities, expressed in grams per denier, and in breaking lengths in kilometers; the latter are the suspended lengths required to break each fiber, under its own weight.

TABLE 1. COMPARATIVE STRENGTHS OF NATURAL AND SYNTHETIC CELLULOSIC FIBERS AT 65% RELATIVE HUMIDITY

Fiber	Tenacity, G./Den.	Breaking Length, Kilometers
"Fortisan" H	7.5	68
Flax	6.6	59
"Durafil"	5.0	45
Hemp	3.8	34
Cotton	3.7	33
Viscose	1.8	16

It will be noted that the order of arrangement is in general agreement with that indicated by the X-ray photographs.

The high degree of orientation and the closeness of packing of the molecular chains of regenerated cellulose in "Fortisan" are responsible for other distinctive physical properties in addition to tensile strength. For example, "Fortisan" has a higher strength in shear than any other form of cellulose, natural or synthetic, though the difference, as would be expected, is small in comparison with the difference in tensile strength. Also "Fortisan" has a lower moisture content than any other form of regenerated cellulose or any natural cellulosic fiber other than cotton, which by reason of its close-packed spiral structure is abnormal in this respect. For similar reasons the ratio of wet strength to dry strength is much

[1] Presented before the Rubber Technology Conference, London, England, June, 1948.
[2] British Celanese, Ltd., 22-23 Hanover Sq., London W.1, England.

higher in "Fortisan" than in any other regenerated cellulose material and approaches most closely to that of cotton and some other natural cellulosic fibers which are slightly stronger wet than dry. The ratio of wet strength to dry strength in "Fortisan" is about 85%; while in viscose the ratio is about 45%.

Figure 2 shows that the form of the stress-strain curve of "Fortisan" yarn differs greatly from that of ordinary rayon, of which viscose is taken as an example. In "Fortisan" the resistance to stretching, which is measured by the ratio of load to elongation, is substantially constant up to the breaking point; whereas with ordinary rayon the resistance to stretching becomes increasingly less as the load increases. This characteristic of "Fortisan" is a valuable property in mechanical applications such as use for the reinforcement of conveyer beltings.

Table 2 gives typical figures for the Young's modulus, or resistance to stretch, of "Fortisan," with those of glass, viscose, and nylon for comparison.

TABLE 2. YOUNG'S MODULUS OR RESISTANCE TO STRETCH

Fiber	Kg./Mm.²	G. Den.
Glass	7362	322
"Fortisan"	2360	168
Viscose	800	57
Nylon	256	26

The conditions under which "Fortisan" yarn is produced are such that a wide range of counts or denier is possible, extending from 10 and 15 denier at one extreme up to 32,000 or even greater at the other. Manufacturing conditions can also be modified so that extensions higher than the normal figure of 7.5% are obtained with slight loss of strength; while filament deniers can be varied as low as 0.1 up to 3.0. In the construction of belting fabrics, a filament denier of unity has been adopted, as this has been found to give the desired balance between stiffness and flexibility.

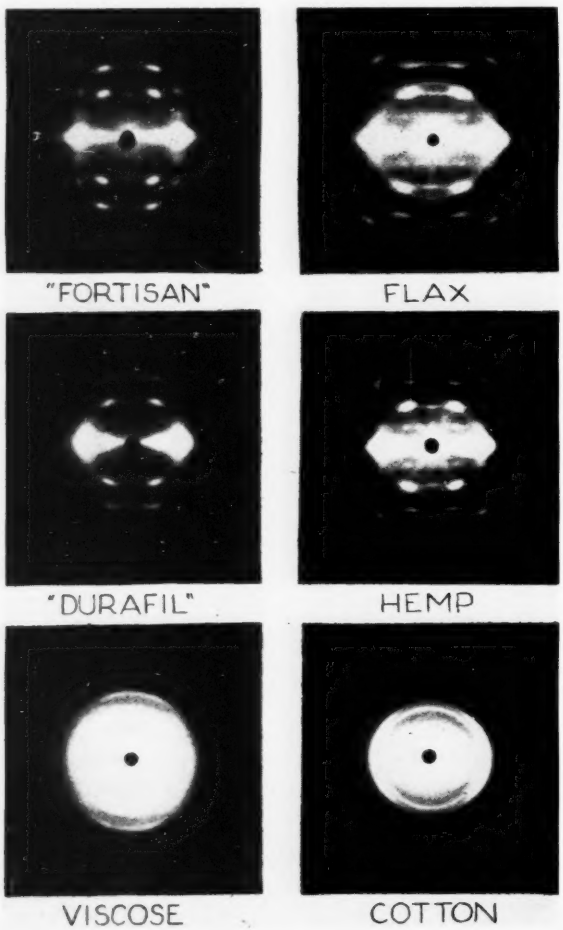


Fig. 1. X-Ray Photographs

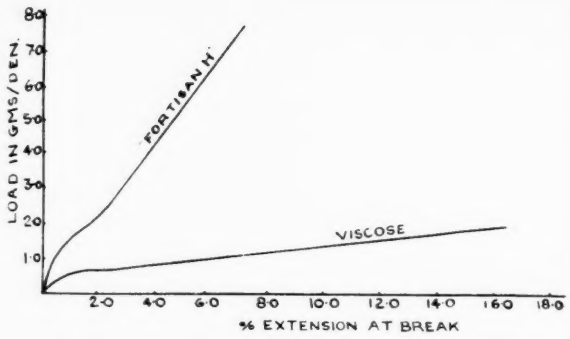


Fig. 2. Stress-Strain Values of Fortisan and Viscose Rayon

For the tire, belting, aand laminated plastics industries it has been found convenient to standardize on a basic yarn of 1,100 denier (4.83's cotton counts) and then to build up suitable yarns or cords from this unit. Thus, singles 1,100, 2,200, 3,300, or 4,400 denier yarns with suitable twists are available for weaving into belting ducks without the need for a preliminary operation.

Since "Fortisan" yarn is a continuous filament material, the insertion of high twists is unnecessary for applications where high strength and lack of stretch are advantageous, such as in belting. The yarn, however, can readily be twisted and cabled into cords for use in tires, where relatively high twists are necessary to obtain the extensions required to increase resistance to high-speed flexing.

The yarn supplied to the doubler and weaver for the production of belting ducks for the conveyer belting industry may be taken to have the typical characteristics shown in Table 3.

TABLE 3. CHARACTERISTICS OF "FORTISAN" CONVEYER BELTING YARNS

Denier	1,100
Filament denier	1.0
Twist	2.5 t.p.i. Z.
Breaking load, lbs.	18
Tenacity, 65% R.H., g./den.	7.5
Wet R.H., g./den.	6.3
Extension, 65% R.H., %	7.5
Wet R.H., %	7.5

TABLE 4. CONSTRUCTION AND STRENGTH OF "FORTISAN" CONVEYER BELTING

Code No.	F4d	F4S	F5d	F5S	Standard Cotton for Comparison
Warp den.	1100×3	3,300	733×3	2,200	7/7's cotton counts
Twist	8Z ×6S	2.5Z	10Z ×8S	5.3Z	
Ends per in.	28	28	34	33	24
Weft den.	1100×3	3,300	733×3	2,200	7/6's cotton counts
Twist	8Z ×6S	2.5Z	10Z×8S	5.3Z	
Picks per in.	14	14	14	14	14
Weave	Plain	Plain	Plain	Plain	Plain
Weight of fabric, ozs. sq. yd.	21.7	21.6	15.5	15.1	28.0
Breaking load of fabric, lbs./in. width	570	580	450	470	415
No. of piles	4	4	5	5	5
Breaking load of belt, lbs. in. width	2345	2420	2415	2355	2070
Weight of rubber in belt, lbs./sq. yd.	8.6	7.7	9.9	9.9	9.5
Fabric in belt, lbs./sq. yd.	5.4	5.4	4.8	4.7	9.0
Total, lbs./sq. yd.	14.0	13.1	14.7	14.6	18.5
Belt thickness, in.	0.244	0.242	0.247	0.257	0.344

The physical characteristics of finished "Fortisan" products in the rubber or plastics industries are, however, dependent on the construction of the fabrics as

well as on the inherent properties of the yarn. For ordinary-duty conveyer belting, use has been made of several types of "Fortisan" duck constructed from both doubled and singles yarns with conventional proportions of warp and weft. In such constructions the weft yarns serve the useful purpose of providing the necessary tear-out strength at the fasteners, but at the expense of limiting the extent to which the yarn strength is preserved as tensile strength in the fabric in the warp direction. Table 4 gives typical constructional details and strengths for the fabrics employed, together with test data for beltings made from these cloths.

It will be seen from Table 4 that when either four plies of 21-ounce "Fortisan" duck or five plies of 15-ounce "Fortisan" duck are used instead of five plies of 28-ounce cotton, the "Fortisan" belt is 15% stronger than a good-class cotton belting, or 30% above the usually accepted figure of 375 pounds per ply, with 53% to 60% of the weight of reinforcing material. It will also be seen from Table 4 that there is no significant difference in test results between beltings made from singles or doubled yarns, or from five-ply 15-ounce or four-ply 21-ounce "Fortisan." The singles yarns have the advantage of eliminating the labor and costs involved in doubling and are naturally preferred for this reason. In practice, the handling of singles yarns of such heavy counts has not presented any appreciable difficulty at any stage in processing.

An advantage of 15-ounce or 21-ounce "Fortisan" ducks is that both can be woven on lighter looms than those normally used for 28-ounce cotton ducks, thus considerably increasing the loom capacity available for this purpose. Further, when a four-ply "Fortisan" belt is used to replace a five-ply cotton, the number of belts produced per loom is at once increased.

It is usually considered that smooth-surfaced, continuous-filament rayons have to be treated with a bonding agent in order to obtain the necessary adhesion to rubber. "Fortisan" beltings have been made up and shown good performance both without and with such treatments; the most convenient to date is the use of the well-known resorcinol-formaldehyde-latex mixture in aqueous dispersion.

This presents no difficulty beyond that associated with the problem of drying such heavy materials. Air drying is advocated for this, as contact drying by steam-heated cans introduces variations in resin polymerization, differential oxidation, and non-uniformity in the application. The amount to be applied is a matter for individual consideration in view of subsequent processing conditions and may range from 2% to 8%, expressed as solids on the dry weight of the cloth.

In use as light-duty belting for the underground transportation of coal, "Fortisan" belting has given excellent service both as face and gate belts. The following advantages may be enumerated:

(1) Ply adhesion remains good, and separation is seldom experienced.

(2) The belt is thinner and more flexible and has only 75% of the weight of cotton belting.

(3) Longer lengths can be used in shallow seams, thus reducing the number of joints, the weakest part of any belt.

(4) The flexibility of "Fortisan" belting gives a better grip on driving pulleys, thus reducing slippage.

(5) The compression and tension forces associated with small-diameter pulleys are reduced.

(6) Impact strength is high, and less damage occurs at the points of transfer.

(7) The belt troughs excellently, and no spillage occurs.

(8) The belt stretches less than cotton belting.

Experience of "Fortisan" as a reinforcing material for belts was obtained under all the difficulties associated with wartime conditions. In comparison with good-quality cotton belting, with the properties shown in Table 4, the "Fortisan" lightweight belts gave a life of 80% longer when used for face belts and 140% longer when used for gate belts.

In view of the above results, "Fortisan" yarn immediately suggests itself for use in high-duty belting where outputs of 200 to 500 h.p. are required. It is appreciated by technicians in the industry that the high strength-weight ratio of "Fortisan" allows longer installations to be used and avoids the need of transfer points due to tandem systems. The necessary plies can be substantially reduced, and the undesirable stiffness that would be associated with a cotton belt of similar strength is avoided. The main problem is to utilize the inherent strength of the yarn to its fullest extent in the final material. Obviously, the ideal condition would be the use of a corded construction with a minimum of weft threads. When belts are made endless by the use of vulcanized joints, this is theoretically possible, though there are various practical difficulties. The problem for the textile technologist is to achieve the highest strengths in the form of cords, for which purpose a study of the typical data summarized in Table 5 will be found useful.

TABLE 5. CHARACTERISTICS OF HEAVY "FORTISAN" CORDS

Construction, Den.	Twist, Turns, per In.	Final Den.	Breaking Load, Lbs. at 65 R.H.	Tenacity, G./Den.	Approximate, Dia., In.
1160×6	2.5S	6680	98	6.7	0.048
2200×3	5Z×2S	11170	147	6.0	0.067
3300×5	4.5Z×1S	16560	213	5.8	0.093
Coreless braid, 1100 den., 24 ends of with ends of 175 den.	binder, 4	28400	363	5.8	0.125

If, instead of cords, a modified woven fabric structure is contemplated, the results given in Table 6 should be found of interest. These are illustrative examples taken from a series of experiments on the influence of cloth structure on warp strength and strength/weight ratio. They give some indication of the scope available to the cloth designer, who will note the very considerable improvement which can be effected in strength/weight ratio and in maintenance of the tenacity of the warp yarn by the use of unconventional weaving constructions.

TABLE 6. EFFECT OF CLOTH CONSTRUCTION ON STRENGTH AND STRENGTH/WEIGHT RATIO OF "FORTISAN" BELTING FABRICS

Ref.	Construction, Ends per In., Picks per In., and Weave	Cloth Weight, Oz./Sq.Yd.	Tensile Strength, Lbs. per In.,	Strength/Weight Ratio	Tenacity G./Den. (on Warp Only)
Standard cotton duck	Warp 7/7's cotton, Weft 7/6's cotton, 24×13 plain	28.0	415	14.8	1.48
Standard "Fortisan" duck, e.g. F4s	Warp 3300 den., Weft 3300 den., 28×14 plain	21.6	580	26.8	2.85
1	Warp 1100×5 den., Weft 1100×5 den., 30×8 plain	31.5	887	28.2	2.44
3	Warp 1100×5 den., Weft flat braid, 30×3 plain	47.8	1215	25.4	3.33
9	Warp 14770 den. braid Ref. B.D. 50 Weft 3300 den., 12×5 plain	27.2	1313	48.3	3.36
16	Warp 3300 den., Weft ½ in. tape, Ref. 7067, 30×2 plain	14.9	1075	72.1	4.93
38	Warp 33800 den. braid Ref. B.D. 34 Weft 1100×4 den., 12×4 plain	59.8	2940	49.2	3.29

The preceding paragraphs have dealt mainly with conveyer belting, but it appears likely that in almost every use of reinforcing materials in the rubber and plastics industries "Fortisan" is capable of playing an equally important part. It has been used successfully for both aero and road transport tires, where its high impact

(*Continued on page 603*)

Full-Spiral Tapping of *Hevea brasiliensis*—I

G. P. Spangler[1] and K. G. McIndoe[1]

FOR some years prior to the recent world war an increasing interest was being displayed by Far Eastern rubber planters in the possible use of tapping systems which could give maximum yields without detriment to the trees, combined with greatest economy in tapping costs. One such system which offered promise is the so called "full-spiral" system, in which the tapping cut extends as a spiral incision around the full circumference of the tree; this cut is tapped on every fourth day, with three days' rest between tappings. The more generally accepted system is the so-called "half-spiral" system, in which the cut extends spirally around half the circumference of the tree and is tapped on alternate days. Theoretically both systems are of similar intensity, but in the case of the full-spiral system, the yield per tapping is higher, and although the tapper is unable to tap as many trees per day as with the half-spiral system, the daily yield per tapper is higher. It was claimed that the tapping cost could thereby be reduced very materially.

But the final acceptance of the system as a permanently useful one depends not only upon its immediate economic aspects, but also upon its effect on the continued satisfactory yield and health of the trees. The proper assessment of the value of any permanent tapping system requires its application over at least six years, and so far as is known, there exists no published literature describing experiments with the full-spiral system over this period. The present paper describes the results of the application of the system to 10 well-known clones as well as to mature seedling trees over a period of 6-7 years.

The most extensive account of experiments with the system is that by Russell[2] in 1941, who describes the results of investigations carried on by the Rubber Research Institute of Malaya in order to discover the "ultimate effects of the system on the development of the trees." Preliminary observations on the use of the system were also published by the R.R.I. over the years 1938-40.[3] Russell reviews the then-existing literature pointing out that in 1919, Sharples and Lambourne employed full-spiral cuts in their studies on brown bast disease. He also refers to the pioneer investigations of the Socfin Co. in Malaya to determine whether full circumference cuts could be used in permanent tapping systems. These investigations covered the three years 1931 to 1933 and have been described by Gain.[4]

The earliest experiment of the R.R.I. was begun in 1935 on mature seedling trees, and results for these trees over five years are presented by Russell. Other results with nine clones as well as a group of mixed clones are given, extending over a period varying from 2-3 years. Unfortunately this valuable series of experiments was abruptly terminated by the occupation of Malaya in 1941. All experiments showed increased yields from full-spiral tapping every fourth day as compared with tapping on half-spiral alternate daily. The proportion of off-grades increased, and the D.R.C. of latex from young trees was somewhat depressed. Tapping costs were reduced by 35%; while growth, as shown by girth measurements, was retarded. Incidence of brown bast was not significantly affected. The following conclusions were stated:

"For young and small trees (under 24-inch girth) full-spiral tapping is not considered suitable as a permanent tapping system on account of the retardation of growth. For several years, however, yield may be increased and tapping cost reduced. . .

"Less evidence has been obtained on the response of older and larger trees, but it appears that the retardation of growth is less serious, and it is considered that full-spiral tapping shows considerable promise as a permanent tapping system for mature areas of high-yielding rubber trees. Further evidence must, however, be awaited before a definite conclusion is reached."

Apparently with these conclusions as a background, a circular[5] concerning the system was issued by the R.R.I. shortly after the resumption of tapping in Malaya in 1945. This circular called attention to the fact that trees which had been out of tapping for approximately four years would present favorable material for application of a full spiral cut; it also contained the strong implication that the system was recommended for permanent application to mature rubber.

The research department of Firestone Plantations Co. initiated the first of a series of experiments on full-spiral tapping in November, 1940. This was followed in 1941 and 1942 by additional similar experiments on clonal rubber and mature seedlings. These experiments were laid out among the following types of rubber:

Av. 49	Ti. 1
Av. 50	Ti. 16
Av. 152	War. 4
Av. 256	P. B. 186
B. D. 5	Seedlings
B. D. 10	

Details of the type and the history of the trees in the different experiments are given in Table 1. At the beginning of the experimental period most of the clonal rubber was 7-10 years old, though in one case (P.B.186) the trees were only 6½ years old. The seedling rubber was 13 years old. With the exception of P.B.186, all the clonal trees had been under a previous period of 1½-3 years' commercial tapping, which used a single half-spiral 100% intensity system. The seedling trees had been previously tapped with a similar system for five years.

Experimental Design

A randomized paired plot experiment was established in each of the 11 types of rubber mentioned above. Each experiment contained two treatments, each of which was replicated eight times. Treatment 1 consisted of the normal half-spiral alternate daily system of tapping, used as the control treatment. Treatment 2 consisted of the full-spiral fourth daily system. All experiments were of task size, each involving approximately 1,500 trees. The half-spiral plots contained approximately 60 trees each, except in the original experiment on Av.50, which had 90 trees per plot. The full-spiral plots consisted of approximately 120 trees each, except in the Av. 50 experiment, where 90 trees per plot were used. The difference

TABLE 1. COMPARISON OF RESULTS FROM FULL-SPIRAL FOURTH DAILY TAPPING (S/1, d/4, 100%) WITH HALF-SPIRAL ALTERNATE DAILY TAPPING (S/2, d/2, 100%)

[1] Research department, Firestone Plantations Co., Harbel, Liberia.
[2] "Full Spiral Tapping." R. Scott Russell. *J. Rubber Research Inst. Malaya*, Comm. 254 (1941).
[3] Annual Reports of the Rubber Research Institute of Malaya for the Years 1938, 1939, and 1940. Rubber Research Institute of Malaya, Kuala Lumpur.
[4] "*Sur la Saignée de l'Hevea.*" F. J. Gain, Thomas, Nancy, France (1936).
[5] "Reduction in Tapping Costs by Full-Circumference Tapping." R.R.I. Circular No. 20, Dec., 1945.

TABLE 1. COMPARISON OF RESULTS FROM FULL-SPIRAL FOURTH DAILY TAPPING (S/4, d/4, 100%) WITH HALF-SPIRAL ALTERNATE DAILY TAPPING (S/2, d/2, 100%)

Age in years at start of experiments	Av. 49		Av. 50		Av. 152		Av. 256		B. D. 5		B. D. 10		Tj. 1		Tj. 16		War. 4		P. B. 186		Seedlings	
	8*		9		8*		7*		7*		7*		7*		7*		7		6½		13	
Years previously tapped on half-spiral	3		2½		2½		2		2		2		2		2		1½		nil		5	
Duration of experimental period	Dec., 1941		Nov., 1940		Feb. 1942		Jan., 1942		Nov., 1941		Nov., 1941		Nov., 1941		Nov., 1941		Jan., 1942		May, 1942		Nov., 1941	
	Nov., 1947		Oct., 1947		Jan., 1948		Dec., 1947		Oct., 1947		Oct., 1947		Oct., 1947		Oct., 1947		Dec., 1947		Oct., 1947		Oct., 1947	
Experiment in years	6		7		6		6		6		6		6		6		6		5½		6	
Yield	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full
Year																						
1	1304	1340	544	719	821	749	412	584	674	887	462	679	723	856	721	743	593	625	487	549	695	766
2	1211	1518	839	911	901	901	475	698	988	963	945	698	1037	901	808	689	610	561	694	648	786	876
3	1064	1758	930	759	935	761	591	611	1043	977	1042	591	1068	891	992	609	1025	564	788	674	652	726
4	1006	1612	1053	819	988	725	496	457	1068	1047	804	506	1138	832	873	485	1129	1024	1185	767	620	755
5	1046	1644	940	796	901	585	564	504	1248	1161	1155	641	1308	872	1106	704	924	704	1159	654	886	964
6	965	533	941	977	891	552	569	625	1305	1092	1221	739	1299	993	959	687	1087	687	1496†	3161†	848	880
7			1284	1068																		
Average annual yield	1088	796	933	864	916	712	475	595	1054	1021	953	642	1096*	891	920	653	895	694	863	658	748	828
Full in % of half-spiral	73		93		78		125		97		67		81		71		78		75		111	
Growth																						
Girth increment of full in % of half-spiral over periods given in Table 4	92		65		51		63		75		58		69		75		66		65		61	
Panel Positions	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full	Half	Full
Year																						
Height of cut in inches above union (clones), or above ground (seedlings) at beginning of each tapping year	40V	40VR	15V	15V	4 40V	4 40V	14V	14V	14V	14V	12V	12V	18V	18V	18V	18V	24V	24V	40V	40V	26R	26VR
	28V	33VR	40V	40VR	33V	36VR 2	40V 7	56V 2	40V 6	52V 5	40V 5	52V 6	18V 6	40V 10	50V 10	50V 6	40V 10	50V	12V	17V	28V	33V	14R	19R
	16V	26VR	28V	30V	20VR	30V	45VR	27V	46VR	28V	47V	33V	47V	33V	47V	33V	47V	50V	10V	27V	16V	27V	2 40R	13R
	4 50V	19VR	16V	27VR 8	50V	22VR	38VR	15V	39VR	16V	40VR	21V	40VR	21V	40VR	38V	50V	50V	20V	32V	50V	20V	32R	6R
	42R	12VR	42R	20VR	44R	15VR 6	52V	31VR 3	52V	32VR 4	52V	33VR 9	52V	33VR 9	52V	33VR	26V	43VR	38V	14V	20R	40R
	30R	6VR	30R	14VR	32R	8VR	42R	24R	45R	25VR	45R	26VR	45R	26VR	45R	26VR	52V	36VR	26V	7V	8 40R	34R
			18R	7VR																		

*Clones marked thus were field budded on seedling stumps 3-4 years old. The other clones were planted as budded stumps. Seedlings were stumps planted †Six months results only.

in plot size for the two treatments was established in order to give each tapper a full daily task. Two experienced tappers were employed on each experimental area, and each tapper tapped two half-spiral plots and one full-spiral plot each day, or a total of 240 trees per task. Since 120 trees of the tapper's task had full circumference panels, a task equivalent to 360 normal half-spiral panels was tapped each day. The tappers followed a tapping schedule which rotated the plots so that all plots were tapped a given number of times each month by both tappers. This policy tended to eliminate any effect due to difference in tapping ability. Moreover, in order to reduce possible differences arising from time of tapping, the plots were rotated each day so that half-spiral plots were tapped first by one tapper, while the other tapper tapped a full-spiral plot first.

The latex from each tree was coagulated in the cup by stirring in a few drops of a weak solution of formic acid at normal collection time. On the following tapping day the coagulated "biscuits" were strung on a wire suspended from each tree. By counting the number of wires from each plot as well as the number of biscuits on the wires, a close check was afforded at the end of each month on the appropriate number of tappings for each plot, as well as upon the efficiency of the tapper in tapping every tree on the scheduled days. At the end of each month the wires with their biscuits were collected from each plot and weighed in appropriate bundles. Since the weight of the wires was held constant, a deduction could be made to obtain the actual field weight of the biscuits. A calculation of the monthly yield per acre was then made by applying a correction for the dry rubber content of the wet rubber (65-70%), the number of trees per acre (110 trees), the number of tapping days per month, and the percentage loss due to dry trees and brown bast. Each year the results were analyzed statistically. The calculated yield per acre for each experiment is also given in Table 1.

While this method of yield recording may not be entirely accurate, it does provide a valid estimate of relative yields and has the great advantage of being virtually foolproof. Moreover it greatly simplifies the yield recording procedure, as well as field supervision. Except in crop collection, the management of all experimental areas followed normal estate procedure; however, closer field supervision was made available to keep the tappers within the proper plots and to facilitate the collection of data. Effort was made to hold bark consumption to a maximum of 12 inches per year for the half-spiral treatments, and to six inches for the full-spiral treatments.

Experimental Results

Yields

In Table 2 is given a summary of the yields of the full-spiral system, expressed as a percentage of the half-spiral system. These figures are given for each type of rubber over the successive years during which the experiments were conducted. Figure 1 illustrates graphically the annual course of the yields from each of the two treatments. It will be seen that over the first year of experimental tapping, all types of rubber except Av.152 yielded more from full-spiral tapping than from half-spiral tapping. In the second and succeeding years, this advantage was maintained in the case of the seedlings; while it persisted in general for Av.256. In the case of all other types, however, a definite depression of yield from the full-spiral system below that of the half-spiral system appeared in the second year, and this depression persisted over the whole course of the experiments.

TABLE 2. FULL-SPIRAL YIELD IN % OF HALF-SPIRAL YIELD

Type of Rubber	Experimental Year							Yield % for Period
	1	2	3	4	5	6	7	
Av. 49	103	68	79	65	59	59		73
Av. 50	132	109	82	78	85	104	83	93
Av. 152	91	94	81	73	65	62		78
Av. 256	142	147	156	110	89	123		125
B. D. 5	132	97	94	98	93	84		97
B. D. 10	147	74	57	57	55	61		67
Tj.1	118	87	83	73	67	76		81
Tj. 16	103	79	61	56	64	72		71
War. 4	105	92	55	91	76	63		78
P. B. 186	113	93	86	65	56	64*		75
Seedling	110	111	111	122	110	103		111

*Six months only.

TABLE 3. DRY RUBBER CONTENT OF FIELD LATEX AFTER SIX YEARS' CONTINUOUS TAPPING WITH HALF-SPIRAL AND FULL-SPIRAL SYSTEMS; OBSERVATIONS MADE NOVEMBER, 1947

Type of Rubber	Half-Spiral D.R.C. in %	Full-Spiral D.R.C. in %	Full-Spiral D.R.C. Expressed in % of Half-Spiral D.R.C.
Av. 49	34.1	27.5	81
Av. 50	41.9	39.2	94
Av. 152	40.3	29.6	73
Av. 256	37.1	34.1	92
B. D. 5	40.5	42.7	105
B. D. 10	40.3	39.5	98
Tj. 1	40.6	37.4	92
Tj. 16	35.3	31.9	90
War. 4	34.9	33.5	96
P. B. 186	37.2	33.1	89
Seedling	36.2	36.7	101

Compared with the control system, the clones varied considerably in the degree to which they responded to full-spiral tapping. B.D.10 yielded 47% more in the first year of tapping, while Av.152 yielded 9% less; other clones were intermediate between these two extremes. During the following years the yields from full-spiral were almost invariably less than from half-spiral. With B.D.5 and Av.50 this relation was not so pronounced, but with most of the well-known clones, such as Av. 49, Tj.1, B.D.10, P.B.186, and War.4, the total yields from full-spiral at the end of six years were less than 80% of those from half-spiral. At the end of these six years, by which time a full tapping cycle had been completed, only Av.256 and seedlings showed higher yields from application of the full-spiral system.

Calculated yields in pounds per acre per year for each clone are given in Table 1. There is a considerable variation in yielding capacity between clones, not only on account of their intrinsic yielding quality, but also on account of the location of the experimental areas on various parts of the plantation. In choosing these areas, it was impossible to locate them contiguously; their location was largely determined by that of the monoclonal or seedling stands of which they form a part. The recorded yields are, in general, slightly higher than those produced by estate tapping, as the areas selected were fully stocked with well-grown stands. The yearly variations in yields of any particular clone were due to relative panel positions of the two treatments, differential bark renewal and union effect. It was for these reasons that all experiments were continued through a complete tapping cycle.

The relation between the yields of the upper and the lower halves of a full circumference cut is of some interest. In the experiment on P.B.186 over the period December, 1942, to October, 1944, the latex from one of the plots on full-spiral tapping was collected in two portions. This collecting was done by insertion of a second spout and cup at a point midway along the length of the cut so that the yields from the upper and the lower halves could be collected separately. Over the period named the upper half of the cut yielded 92% of the lower half. The reason for this yield is likely to be found in the fact that the latex drainage area of the upper half is to some extent restricted by that of the lower half.

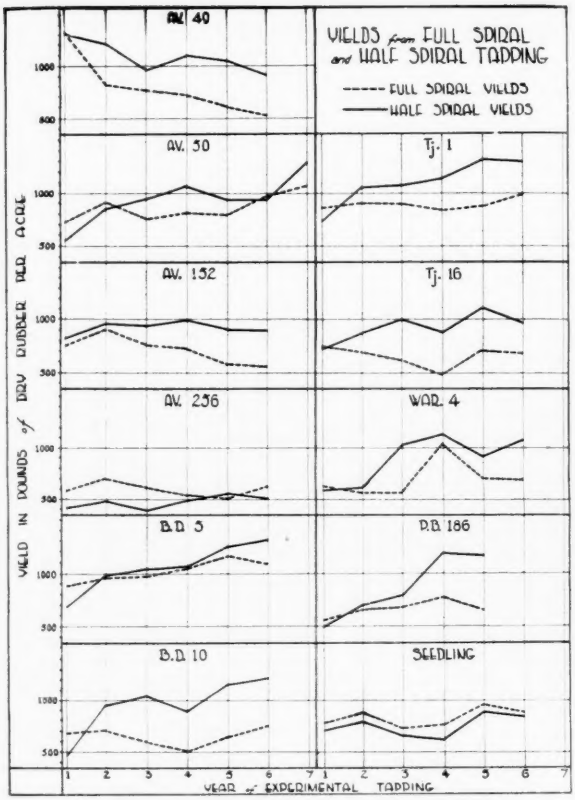


Fig. 1. Yields from Full-Spiral and Half-Spiral Tapping

Toward the end of the full tapping cycle of each experiment, that is, after six years' continuous tapping, the dry rubber content of the field latex from each of the two treatments was determined. A summary of the figure obtained is given in Table 3. In the case of all clones except B.D.5, latex from full-spiral tapping showed a lower D.R.C. than latex from half-spiral tapping. This was especially marked with Av.152. No difference was evident in the case of mature seedlings.

Growth

Table 4 presents a summary of growth data relating to the two tapping systems on each type of rubber. Mean girth increments have been computed for each treatment over the periods shown in the table. The first reliable measurements of girth were not taken until about one year after the beginning of most of the experiments; consequently the periods over which increments were observed cover in general the last five years. In this period, however, it is obvious that a very definite retardation of growth was produced on all clones and seedlings by continued use of the full-spiral system. Among the various types, however, there appears to be little direct relation between retardation of growth and depression of yield. Over the three-year period of observation for mature seedlings, even this type showed an increment of only 61% of that recorded on the half-spiral treatment. Among the clones, full-spiral tapping produced the greatest retardation on Av.152 and B.D.10, reducing the increment by nearly one-half of that recorded on trees under half-spiral tapping. In some cases an abnormal growth developed immediately above the full-spiral cut, due probably to a partial stoppage of the passage of food materials down the bark. This effect was especially noticeable in B.D.10, and Figure 2 is a

TABLE 4. GIRTH MEASUREMENT

Type of Rubber	Height Above Union Inches	Date	Original Girth in Cms.		Girth Increment in Cms. Total Oct., 1947		Full-Spiral Increment in % of Half-Spiral
			Half-Spiral	Full-Spiral	Half-Spiral	Full-Spiral	
Av. 49	65	Dec., 1942	71.6	66.8	16.1	14.8	92
Av. 50	48	Dec., 1942	64.8	60.7	16.2	10.5	65
Av. 152	65	Oct., 1944	60.2	56.1	7.8	3.2	51
Av. 256	65	Jan., 1943	49.8	51.5	16.0	10.0	63
B. D. 5	65	Dec., 1942	57.4	55.0	14.0	10.5	75
B. D. 10	65	Dec., 1942	55.4	53.6	14.2	8.2	58
Tj. 1	65	Dec., 1942	56.4	54.2	16.0	11.0	69
Tj. 16	65	Dec., 1942	55.2	54.0	15.4	11.5	75
War. 4	60	Dec., 1942	52.9	49.9	16.9	11.1	66
P. B. 186	55	Dec., 1942	47.8	45.5	21.1	13.7	65
Seedling	65*	Oct., 1944	87.6	84.2	6.4	3.9	61

Original girth measurements taken 1-3 years after opening of experimental areas.
*Above ground.

Fig. 2. Longitudinal Sections of Stem, Showing Abnormal Developments of Wood above Tapping Cut, Following upon Full-Spiral Tapping of Young B.D.10 Clonal Rubber

photograph of longitudinal sections of selected stems of this clone, in which the swellings can be seen clearly. The bark of this clone is usually thin, and the full-spiral cut appears to have had a girdling effect on the tree, causing an overgrowth of the wood above the tapping cut.

Other observations were made in the field from time to time regarding wintering and seed production of neighboring plots under the two systems of tapping. Defoliation not only occurred earlier on the full-spiral plots, but in most cases where it was pronounced, it also extended over a longer period of time. This difference in wintering was manifested to a varying degree in accordance with the clone, but Av.50, B.D.5, P.B.186, and War.4 showed it as early as the second year of experimental tapping. In the plots of Av.50 on full-spiral tapping, it was observed that the tree had a tendency to flower and produce seeds at intervals throughout the year other than the normal flowering and seed production season. This tendency was not evident on the half-spiral plots. Since it is known that flowering and fruiting can be artificially induced by partial girdling, it is reasonable to assume that these effects were induced by full-spiral tapping.

Bark Consumption and Renewal

It has already been stated that effort was made to hold bark consumption to a rate of 12 inches per year for the half-spiral system and to six inches per year for the full-spiral system. While this practice presented no difficulty with the former system, in the case of the latter it was found that bark consumption was 10-15% above the maximum of six inches aimed at. Most of this over-consumption tended to occur during the dry season, when the three days' rest between successive tappings caused the cut to dry out. This effect caused the tappers to consume more bark at each tapping.

TABLE 5. BARK RENEWAL

Type of Rubber	Average Thickness of Renewed Bark 5-6 Years Old in Mms.	
	Half-Spiral	Full-Spiral
Av. 49	8.9	8.6
Av. 50	9.0	9.6
Av. 152	7.1	8.4
Av. 256	9.6	9.2
B. D. 5	9.0	9.0
B. D. 10	8.9	8.9
Tj. 1	9.1	9.3
Tj. 16	8.7	8.9
War. 4	8.2	8.4
P. B. 186	9.2	9.5
Seedling	7.3	7.2

Bark renewal was measured by means of a Lindeteves-Stokvis bark thickness gage. Measurements were made on bark of 5-6 years' renewal following upon the two systems of tapping. In Table 5 will be found figures representing the average thickness of renewed bark for each type of rubber. The differences recorded are small and not such as to justify discrimination between the systems on this account. From the data given in Table 1 on panel positions, it will be noted that in the second year of tapping, most full-spiral cuts were moved from the base of the tree to a height of 40-50 inches above the union. In such cases, where the full-spiral cuts were opened above renewing bark, the renewal of the lower panel was satisfactory.

In original establishment of the cuts for full-spiral tapping, it was necessary to place them in such a way as to delay their partial encroachment upon renewing bark of the previous period of estate tapping. This positioning was not entirely possible, as the notations concerning panel positions in Table 1 will indicate. In such cases, while half of the length of the cut traversed virgin bark, the other half eventually cut through bark of 4-6 years' renewal. For a few clones, this condition may have reduced the yield of the full-spiral system, but not in sufficient degree to detract from the validity of the comparisons made between the two systems. For most clones the cuts of both systems were on virgin bark at least over the first three years, and during this period the lower yield from the full-spiral system had already become apparent.

Brown Bast and Black Thread Disease

Observations on the incidence of brown bast were conducted throughout the course of the experiments, and in October, 1947, a complete examination was made of all trees in each experiment. In Table 6 will be found a summary of the total number of trees under observation, the number of "dry" trees, and the number of those classified as "chronic" cases. Dry trees were those whose tapping cuts were dry for unknown reasons, or on account of early manifestation of the disease. Chronic cases were those on which the panels had become marred by the burls and irregularities typical of advanced stages of the disease. Since October, 1944, all trees except those which had been rendered untappable on account of chronic brown bast were kept in tapping, even though apparently dry. This practice was adopted because it

(*Continued on page* 598)

Preparation and Vulcanization of Unsaturated Acrylic Elastomers—I

W. C. Mast[1] and C. H. Fisher[1]

IT WAS shown in earlier papers (1, 2)[2] from this Laboratory that methyl and ethyl acrylate resemble isobutylene (2) in that they can be copolymerized with a small proportion of a polyolefinic monomer, such as butadiene or isoprene, to vulcanizable copolymers. Rubber-like vulcanizates were obtained (1, 2) by compounding the copolymers—assumed to contain olefinic unsaturation—with sulfur and accelerators and molding the compounded stock at approximately 150° C. This finding was followed by an expansion of the acrylic elastomer investigation to include (a) the preparation and vulcanization of additional unsaturated acrylic elastomers, (b) the development of special recipes (4) capable of curing ethyl polyacrylate and similar saturated acrylic resins, and (c) a search for functional groups other than olefinic linkages that can be used conveniently for vulcanization purposes.[3]

TABLE I

POLYENES USED IN THE PREPARATION OF ACRYLIC ESTER COPOLYMERS*

Polyene	Boiling Point, °C.	Percentage Equivalent to 2% Butadiene†
Butadiene-1, 3	5[10]	2.00
Isoprene	33.5	2.52
Pentadiene-1, 3‡	42-44	2.52
Cyclopentadiene	41-42	2.52
2, 3 Dimethylbutadiene-1, 3§	71	3.04
Myrcene	68[20]	2.52
Divinyl benzene	•	4.84
Allo-ocimene**	90[21]	2.52
2-Methylpentadiene-1, 3	76	3.04
Chloroprene	59.4	3.27
Vinyl cyclohexene-3	Not distilled	4.00

POLYOLEFINIC ESTERS USED IN THE PREPARATION OF ACRYLIC ESTER COPOLYMERS

Ester		
Allyl maleate	78[0.5]	3.67
Furfuryl acrylate††	93[18]	2.83
Crotyl acrylate††	60[23]	4.70
Cinnamyl acrylate††	108[1.2]	7.0
Citronellyl acrylate††	108[3.4]	7.8
Geranyl acrylate††	116[6.2]	3.87
Allyl lactate maleate	Not distilled	6.3
Allyl diglycol carbonate	160[2]	10.1
Rhodinyl acrylate††	107[4.2]	7.8
4-Methyl-4-penten-2-yl acrylate††	62[13.5]	5.7
Allyl phthalate	150[1]	

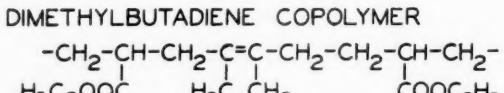
POLYOLEFINIC ETHERS USED IN THE PREPARATION OF ACRYLIC ESTER COPOLYMERS

Ether		
Vinyl ether	39	2.6
Di-allyl glycol	35[5]	5.26
Allyl ether	94.3	3.62
Methallyl ether		4.65
Tetra-allyl-alpha-methyl-glucoside‡‡	160[1.5]	4.36
Allyl starch§§		10

*The sources of these monomers are acknowledged at the end of the paper.
†Proportion in % of the polyolefinic monomer required to give a copolymer having the calculated vulcanizable unsaturation of a 98% ethyl acrylate–2% butadiene copolymer (assuming one residual double bond).
‡Prepared in the Northern Regional Research Laboratory by pyrolysis of the corresponding gylcol diacetate (10).
§One of the samples used was prepared by pyrolysis of pinacol diacetate (11).
Myrcene: $(CH_3)_2C{:}CHCH_2CH_2C(CH{:}CH_2){:}CH_2$.
•Purified by fractional recrystallization.
**Allo-ocimene: $(CH_3)_2C{:}CHCH{:}CHC(CH_3){:}CHCH_3$
††Preparation described in (12).
‡‡Preparation described in (13).
§§Preparation described in (14).

[1] Eastern Regional Research Laboratory, Agricultural Research Administration, United States Department of Agriculture, Philadelphia 18, Pa.
[2] Numbers in parentheses refer to Bibliography items at end of this article.
[3] The vulcanization of saturated acrylic elastomers containing halogen, nitro, cyanoethyl and other groups with sulfur and accelerators has been the subject of several papers (4-9). The vulcanization of an ethyl acrylate-methyl vinyl ketone copolymer with sulfur and accelerators, demonstrating the usefulness of the methyl ketone group in vulcanization, will be described in a forthcoming paper.
[4] Throughout this paper the term "copolymer," used in the broader sense (15), includes any product made by polymerizing a mixture of monomers. Possibly amenability to vulcanization with sulfur and accelerators indicates that true copolymers were formed.
[5] The mention of specific brands in Table 2 and in other parts of the paper should not be construed as an endorsement or recommendation of these brands over others not tested.

DIMETHYLBUTADIENE COPOLYMER



CROTYL ACRYLATE COPOLYMER

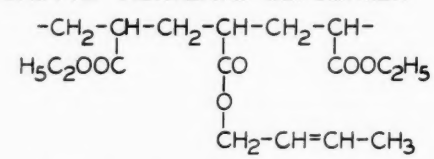


Fig. 1. Dimethylbutadiene and Crotyl Acrylate Copolymers

This paper reports the vulcanization of additional unsaturated acrylic elastomers prepared by copolymerizing acrylic esters with a small proportion of 11 dienes, 11 polyolefinic esters, and six ethers (Table 1). The purpose of the work was to prepare improved elastomers, ascertain qualitatively the tendency of the polyolefinic monomers of widely different character to form cross-linked copolymers, and to obtain information on the effect of polymer structure (as determinated by the selection of monomers) on the rate of curing and properties of the vulcanizates.

It would be expected that the unsaturated copolymers[4] obtained with the polyfunctional monomers of Table 1 would differ considerably in structure, leading to differences in curing rate and properties of the vulcanizates. These differences could arise from dissimilarities in both the structure and location of the olefinic linkages. For example, the unsaturation in the 2,3-dimethylbutadiene copolymers should be principally in the polymer chain and characterized by the presence of two methyl groups; whereas the unsaturation in the crotyl acrylate copolymers should be principally in side chains and subject to less steric hindrance. (See Figure 1.)

Experimental Details

The polyolefinic monomers (Table 1) were prepared here (2) or obtained from other organizations. When desirable and feasible, the monomers were further purified by washing with alkali and distillation.

The monomers were emulsion polymerized by the method previously described (16). The polymerizations were carried out in a round-bottom, three-neck Pyrex flask fitted with glass-ground joints for a condenser, water-sealed glass stirrer, and thermometer well. Water and emulsifier were stirred and heated (below 85° C.) in the flask until a smooth dispersion or solution was obtained. The monomers were then added, and polymerization was induced by heat and catalysts (Table 2).[5] Ammonium persulfate was used to initiate polymerization in most instances, but hydrogen peroxide, benzoyl peroxide, and succinic acid peroxide were also used. Acrylonitrile and dodecyl mercaptan were used in some polymerizations to decrease cross-linkage. The emul-

TABLE 2. EMULSION POLYMERIZATION OF DIENE—ETHYL ACRYLATE MIXTURES

Expt. No.	Diene	Diene, %	Acrylonitrile, %	Dodecyl Mercaptan, %	Ammonium Persulfate, %	Tergitol Penetrant #4*, %	Solids, %	Temperature °C.	Time, Hours	Yield, %
E31†	Butadiene	2	6	..	0.10	1	25	75–77	5.0	50
E32†	Butadiene	2	6	..	0.15	1	25	75–77	5.0	60
E33†	Butadiene	2	6	..	0.22	1	25	75–77	5.0	70
D45	Isoprene	2.1	..	..	0.13	0.75	25	77–92	0.8	95.5
D46	Isoprene	2.1	6	..	0.09	0.75	25	77–92	1.7	91
D47	Isoprene	2.1	6	0.10	0.09	0.75	25	77–92	1.5	92
D48	Isoprene	4.2	6	0.10	0.10	0.75	25	75–92	1.7	77
D49	Isoprene	8.4	6	0.10	0.14	0.75	25	75–92	2.3	85
D97	Isoprene	2.1	6	..	0.11	0.75	37.5	77–92	3.5	95
D125	Isoprene	2.1	6	....	0.09	0.75	37.5	77–92	7.0	87
D50	Piperylene	2.1	..	..	0.10	0.75	25	78–92	2.2	97
D51	Piperylene	2.1	6	..	0.06	0.75	25	78–92	1.3	91
D52	Piperylene	2.1	6	0.10	0.08	0.75	25	78–92	1.2	94
D53	Piperylene	4.2	6	0.10	0.09	0.75	25	78–92	1.7	91
D81	Piperylene	2.1	6	..	0.06	0.75	25	78–92	2.7	86
D82	Piperylene	2.1	9.3	..	0.075	0.75	25	78–92	5.7	77
D83	Piperylene	2.1	6	..	0.05	0.75	25	78–92	2.5	87.5
E18	2, 3 Dimethylbutadiene	2.6	0	..	0.07	1.75	20	77–92	0.7	93
E19	2, 3 Dimethylbutadiene	2.6	6	..	0.05	1.75	20	77–92	1.0	90

* Moisture free basis.
† In agitated sealed bottles under pressure.

sions were refluxed during the polymerization, and at refluxing temperature a period of 30 minutes to several hours was usually required. The temperature rose during the polymerization from about 72 to 82° C. and from 82 to 92° C. when methyl acrylate and ethyl acrylate, respectively, were the principal monomers. Hence the course of the polymerization could be followed roughly by noting the temperature. The extent of polymerization could be followed also by observing changes in the refractive index, density, and solids content of the emulsion. At the end of the polymerization any unchanged methyl acrylate or ethyl acrylate was removed by blowing steam through the emulsion.

The refluxing temperature was lowered at the beginning of the polymerization when low-boiling dienes were used (butadiene copolymers were prepared in pressure vessels). Gentle refluxing was maintained, and the temperature was allowed to rise gradually during the polymerization. In some instances preliminary runs were required to determine the correct amount of catalyst. The minimum amount of catalyst that would cause polymerization within a reasonable time (usually one hour to three hours) was used. It was found desirable to have little or no induction period before the start of the polymerization to reduce the possibility of side reactions of the monomers or emulsifying agents and to prevent excessive precoagulation during the reaction. The monomers were mixed immediately before being added to the aqueous phase or added separately. The addition of sufficient catalyst in one lot to cause polymerization was preferable to several additions of smaller quantities at half-hour or longer intervals because the total required quantity of catalyst was less, and side reactions were less troublesome. A period of five to 15 minutes was usually required to heat the mixture to refluxing, and the induction period could often be reduced or virtually eliminated by adding the catalyst just before heating was started.

When polymerization was considered complete, the latex was coagulated by adding it while hot to twice its volume of hot, rapidly stirred, 5% sodium chloride solution. The resulting fine, discrete, rubber-like crumb was washed five to seven times with hot distilled water. (Washing was continued until the wash water gave a slight or negative test for chloride ion.) No trouble was encountered when the temperature of the wash water was kept above 90° C., but the polymer lumped together and was difficult to wash at lower temperatures. The copolymers were air dried for several days at room temperature. Randomly chosen samples dried in this manner contained less than 0.5% water.

The solubility characteristics of the copolymers were ascertained, and toluene solutions of the soluble copolymers were prepared and used in the determination of intrinsic viscosity. Insolubility was generally considered evidence of cross-linkage, effected either through the olefinic unsaturation or caused by free radical cross-linkage (initiated by the polymerization catalyst) of the ethyl polyacrylate portion of the copolymer chain.[6] Most of the insoluble copolymers formed loose, easily dispersed gels that were entirely different from the gel fraction of GR-S rubber and probably were indicative of a low degree of cross-linkage. The soluble and insoluble fractions of the copolymers were not examined in detail, although a study of the type of gel and the ease of its dispersion might have given significant results.

The copolymers were judged further by their general appearance, the ease with which they could be drawn (manually) into filaments, their behavior on milling, and the physical properties of the vulcanizates. A small rubber mill[7] was used for the compounding (80 to 110° F.). The stocks were cured as slabs 0.03-inch thick and tested on a modified Scott L-6 tester. Brittle points were determined by the method of Selker, Winspear, and Kemp (*22*). The work reported herein was done prior to the discovery in 1945 (*6*) that milling at about 160° F. is preferable to milling at lower temperatures.

Ethyl Acrylate—Diene Copolymers

Preparation of the diene copolymers of Table 2 required substantially larger amounts of catalyst than that normally used to polymerize ethyl acrylate.[8] Possibly the retarding effect of the diene and the use of increased amounts of catalyst were partly responsible for the fact that the diene copolymers were different from ethyl polyacrylate in being insoluble in toluene, having a drier appearance and less tack, and in being less easily drawn into filaments. The diene copolymers resembled other ethyl acrylate polymers and copolymers prepared in this Laboratory in that their behavior on being drawn with the fingers into filaments was related to their general appearance and their solubility characteristics. For example,

[6] Ethyl polyacrylate made in the presence of relatively large amounts of polymerization catalyst is insoluble and presumably cross-linked (*17*). Benzoyl peroxide has been used to cross-link ethyl polyacrylate (*4*) and other polyesters (*18, 19*). Presumably the cross-linkage is caused by decomposition of the benzoyl peroxide into free radicals, removal of hydrogen from the polymer chain to yield a polymer free radical, and combination or union of two of the polymer free radicals. A more detailed explanation will be found in (*4*) and (*19*).

[7] The scale of operation was somewhat larger than that used by Fryling (*20*) and Garvey (*21*) in preparing and testing small quantities of elastomers.

[8] Ethyl acrylate of moderate purity can be readily emulsion polymerized (refluxing) with 0.005% or less of ammonium persulfate in one hour; the temperature of the vapor increases from 82 to 92° C. Monomer mixtures containing 5% 2-chloroethyl vinyl ether or 2-chloroethyl acrylate (*4, 17*) can be polymerized under similar conditions without appreciably increasing the catalyst concentration.

the polymers that could be readily drawn (slowly to allow for cold flow) into threads and eventually into virtually invisible filaments were usually soluble in benzene, toluene, ethyl acetate, dioxane, and similar solvents. The polymers that gave coarse threads having uneven sections usually formed dispersible gels with solvents. Polymers that tore across thick sections and contained lumpy portions in the stretched area yielded less dispersible gels or remained as discrete swollen masses.[9]

Butadiene, isoprene, and dimethylbutadiene had diminishing tendencies to form cross-linked copolymers during polymerization in the order named. Isoprene and piperylene had about the same tendency to form cross-linked copolymers. The best vulcanizates were obtained from the isoprene, piperylene, or dimethylbutadiene copolymers. The vulcanizates from the diene copolymers appeared less lively, that is, retracted more slowly, than the vulcanizates from the ethyl acrylate-chloropropyl acrylate and chloroethyl vinyl ether copolymers (4, 7).

Earlier results, obtained in a study of ethyl acrylate-allyl maleate copolymers, showed that dodecyl mercaptan and acrylonitrile were helpful in decreasing cross-linkage. In the present study neither mercaptan nor acrylonitrile was noticeably beneficial in attempts to prepare soluble diene copolymers.

The vulcanizates obtained from the butadiene copolymers had tensile strengths of 1100 to 1300 p.s.i., but the ultimate elongation was slightly under 300% (Table 3).

TABLE 3. VULCANIZATION* OF DIENE—ETHYL ACRYLATE COPOLYMERS
(Preparation Described in Table 2)

Copolymer No.		Curing Time at 298° F. Min.	Tensile Strength P.S.I.	Ultimate Elongation %	Shore A Hardness	Brittle Point °C.
E31	Butadiene	180	1280	270	61	
E32	Butadiene	120	1240	290	60	
E33	Butadiene	120	1160	280	62	
D45	Isoprene	120	630	730	49	—15
D46	Isoprene	120	1130	680	55	—11
D47	Isoprene	120	990	750	58	— 9
D48	Isoprene	120	1200	370	66	— 7
D49	Isoprene	60	1190	210	65	— 4
D47	Isoprene	180	1190	550	60	—10
D125	Isoprene	180	840	560	54	
D50	Piperylene	60	820	780	48	—18
D51	Piperylene	180	1110	910	58	— 8
D52	Piperylene	120	510	1020	60	— 8
D53	Piperylene	60	670	640	62	— 8
D81	Piperylene	120	1020	590	62	— 6
D82	Piperylene	60	920	770	55	— 4
D83	Piperylene	60	940	830	50	
E18	2,3 Dimethylbutadiene	240	930	530	53	
E19	2,3 Dimethylbutadiene	240	1310	450	62	

*Recipe: copolymer, 100 parts; 2-mercapto benzothiazole, 0.5 part; zinc oxide, 5 parts; stearic acid, 2 parts; sulfur, 2 parts; tetramethyl thiuram disulfide, one part; and SRF carbon black, 30 parts.

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(To be concluded)

[9] These observations are based on the dissolution or dispersion of approximately 0.1 g. of polymer in 100 ml. of toluene.

Full-Spiral Tapping

(Continued from page 595)

has been observed that not infrequently trees which might have been put out of tapping on account of supposed brown bast return to normal yield even though tapping is continued.

Comparison of the figures representing incidence of brown bast in Table 6 will show that appreciably higher incidence following full-spiral tapping was found only in the clones Av.49 and Tj.16. As a whole, it cannot be said that full-spiral tapping resulted in an unduly high percentage of brown bast.

TABLE 6. INCIDENCE OF DRY AND BROWN BAST TREES, OCTOBER, 1947

Type of Rubber	Tapping System	Total Number Trees	Number Dry Trees	%	Number Chronic B.B.	%	Total % Affected
Av. 49	Half	480	47	9.8	0	0.0	9.8
	Full	840	110	13.1	3	0.4	13.5
Av. 50	Half	541	13	2.4	0	0.0	2.4
	Full	722	10	1.4	4	0.7	2.1
Av. 152	Half	477	7	1.5	4	0.8	2.3
	Full	956	20	2.1	12	1.3	3.4
Av. 256	Half	450	4	0.9	0	0.0	0.9
	Full	881	6	0.7	5	0.7	1.4
B. D. 5	Half	482	12	2.5	12	2.5	5.0
	Full	1000	20	2.0	26	2.6	4.6
B. D. 10	Half	471	16	3.4	3	0.6	4.0
	Full	958	14	1.5	4	0.4	1.9
Tj. 1	Half	465	6	1.3	3	0.6	1.9
	Full	912	6	0.7	9	1.0	1.7
Tj. 16	Half	478	13	2.7	10	2.1	4.8
	Full	942	14	1.5	49	5.2	6.7
War. 4	Half	480	12	2.5	1	0.2	2.7
	Full	959	17	1.8	6	0.6	2.4
P. B. 186	Half	464	28	6.0	20	4.3	10.3
	Full	920	22	2.4	52	5.7	8.1
Seedling	Half	509	14	2.8	8	1.6	4.4
	Full	970	18	1.9	28	2.9	4.8
Total	Half	5297	172	3.2	61	1.2	4.4
	Full	10060	257	2.6	198	2.0	4.6

In Liberia the wet season is characterized by heavy rains frequently of long duration, interspersed with overcast skies. During the months of July, August, and September records of bright sunshine average only 50 hours per month. Together with the prevailing high relative humidity these conditions are conducive to the appearance of black thread (due to *Phytophthora palmivora*) in epidemic proportions, unless effective fungicidal applications are made to lessen the severity of the disease. Such applications were regularly carried out on the experimental areas, and during the wet season of 1947 no severe cases were observed on any of the plots under full-spiral tapping. However on plots under half-spiral tapping in the clones B.D.5, Tj.16, and Av.49 heavy infections were observed. Since these plots were contiguous to those on the full-spiral system and were tapped by the same tapper, there would seem to be little doubt that there was equal opportunity for the spread of inoculum. It has been concluded by Darley and Silverborg[6] that the three-day resting period between successive tappings of the full-spiral system tended to reduce opportunity for infection.

[6] "Black Thread Disease of *Hevea brasiliensis*." E. F. Darley, S. B. Silverborg. In publication.

(To be concluded)

Advances in Rubber, 1947-1948—II[1]

Lois W. Brock,[2] G. H. Swart,[2] E. V. Osberg[2]

THE following is the second installment of the paper on the advances in rubber during the last quarter of 1947 and the first half of 1948, as presented by Mr. Osberg at the recent A.S.M.E. annual meeting. This article began in our January issue and will conclude in our April issue.

Latex

Since the end of the war the interest in natural rubber latex has been renewed, and there are indications that consumption of rubber in this form will expand considerably in the future, particularly for sponge. The market for latex foam in the United States has been discussed (44).[3] A comprehensive review has pointed out what plant and shipping facilities are available for the rehabilitation of latex operations in the Far East and covers the status of natural *vs.* synthetic latex with production figures and anticipated consumption (45). Quality control on postwar latex has been reviewed (46), and a comprehensive study covering our present knowledge of preparing latex for bulk sale has been presented (47).

Work has been done on electrical coagulation (48), continuous coagulation (49), and the use of sulfurous acid as a coagulant (50). Methods of concentrating latex (51-54) include the use of electro-decantation, centrifuging, and creaming. In order to avoid expense and time-consuming concentration operations it has been found possible to produce high-solids synthetic rubber latices directly in the reactor (55).

A postwar review of latex processes and its possibilities covers dipping (56), molding and casting (57), and cement-latex operations (58). Particular attention is given to the molding of rubber goods from latex by means of the Kaysam process (59). The saturation and impregnation of paper with latex compound (60) and the use of latex containing a positive charge, as applied to textile fiber (61), have been reviewed.

Vulcanizing, Aging, and Compounding

Studies on the mechanism and theory of vulcanization continue to absorb the interest of rubber technologists (62-69). Special attention was given to the study of the vulcanization of chlorine-containing acrylic ester elastomers (70) and to the application of the Peachey process to the curing of synthetic rubbers (71). The advantages of vulcanizing with thiuram sulfides, which reduce swelling, have been pointed out (72).

The use of accelerators in the last century has been reviewed and brought up to date, and the possibilities of fast cures through high-frequency vulcanization have been pointed out (73). In view of the trend toward high-speed Banbury mixing in which high temperatures are generated, a study has been made to determine the effect of such temperature on the activity of a representative group of rubber accelerators (74). It was concluded that all the accelerators tested showed some impairment in strength due to the high processing temperature and that some types lost greatly in accelerating value.

Experiments have been described to show that the combined use of an antioxygenic agent and a deactivating agent makes it possible to improve the aging of rubber mixtures to a considerable extent (75-76). The difference in behavior of these two types of agents is explained by assuming that some agents act not by retarding the rate of oxidation, but by deactivating the peroxides as soon as they are formed. This theory is supported in another study (77). A further contribution to the mechanism of oxidation is illustrated by showing possible transformations which each isoprene unit in the rubber molecule may undergo during oxidation (78). It has been found that the profound degradation of rubber by oxygen in the presence of benzoyl peroxide is related to phenomena involving the alpha-methylenic hydrogen of the rubber hydrocarbon (79). Work is described to establish the relative characteristics of various compounding ingredients including antioxidants with respect to their tendency to stain enamel finishes and to discolor light-colored compounds (80). In a search for suitably effective non-discoloring antioxidants it was revealed that alkyl phenols impart protection to vulcanizates of copolymers of butadiene with styrene and acrylonitrile (81).

Work continued on the fundamental properties of carbon black including surface area measurements (82), heats of adsorption (83), crystal structure and particle shape (84). Heat treatment of rubber-channel black stocks or treatment with certain chemicals such as benzidine enhance the chain-breakdown during remilling which results in increased electrical resistance (85). A general review of the properties of carbon black in relation to its behavior in rubber has been presented (86). The properties and uses of soft carbon blacks in natural and synthetic rubber stocks have also been reviewed (87). Particular attention has been given to the recently introduced fine furnace blacks, with some evidence indicating improved reinforcement over other types of black (88-90).

An extensive study has been made covering the activity of rubber fillers and the relation between crystallinity and various physical properties of the rubber compound (91). The mechanism of reinforcement of elastomers by pigments such as calcium carbonate and HMF black has been studied with particular reference to modulus (92). GR-S-10 has been substituted in GR-S test vulcanizates containing various types of pigments, and the effect of this substitution on physical properties has been evaluated (93). New fillers for rubber have been disclosed: "Teg," a hydroxide gel of aluminum with a particle size of 0.01-1.0 micron (94), and Frantex-A, a finely ground hydrated aluminum silicate (95-96). Studies have been made on compounding as it affects oil resistance of natural rubber (97) and on the influence of fillers on the properties of natural and synthetic rubbers after swelling (98). Experiments based on rheological phenomena have been described on coarse-grained and fine-grained materials showing the value of this approach as applied to coarse-grained sponges of rubber and how much the sponge can be varied structurally (99).

A comprehensive survey on the technology of color,

[1] Presented before the Rubber & Plastics Division, A.S.M.E., New York, N. Y., Nov. 30, 1948. In accordance with the policy of A.S.M.E. which aims to have future papers of this nature cover the literature from June of one year through the following June, the present paper begins where "Advances in Rubber in 1947" ended, viz., October, 1947, and continues through June, 1948.

[2] General Tire & Rubber Co., Akron, O.

[3] Numbers in parentheses refer to similarly numbered references in bibliography at end of this installment. Unnumbered, supplementary references are found with related articles in the bibliography.

as applied to rubber, has been made covering mass pigmentation, lacquers and surface dying processes (100). The influence of accelerators, antioxidants, method of vulcanization, type of mold metal, and the relation between the chemical properties of color and the other ingredients in the rubber mix have been considered.

Mechanism of plasticizer action has been analyzed for linear and slightly and highly-cross-linked polymers with consideration of the flexibility of the polymer chain, polar interaction of groups along the chain, the masking of these interactions by plasticizer molecules, and the importance of the relative shape of polymer unit and plasticizer in effectiveness of separating the chains (101). The miscibility of plasticizers with polymers and the migration of plasticizers have been studied, and correlations of physical properties with viscosity of the plasticizer have been set forth (102). Petroleum products have been given special attention, with the underlying principles and major operations in their chemical manufacture emphasized (103). A German tabular study presents the trade names, manufacturers, chemical formulae, properties and uses of softeners for the rubber industry (104). Recent investigation of immiscible polymeric plasticizers such as polyisobutylene is said to result in excellent processing properties and physical properties comparable to those obtained when miscible ester plasticizers are used (105). Work on resinous styrene-butadiene copolymers containing high proportions of styrene has proceeded (106-108), and data on blends of these resins with various elastomers have been presented. A water-dispersed form of such a resinous copolymer has been evaluated as an additive to natural and synthetic rubber latices (109). S-Polymers, new thermoplastic resins, are copolymers of styrene and isobutylene produced by a low-temperature technique similar to that used for Butyl rubber (110). These polymers can be used alone as a plastic having rubber-like characteristics such as extensibility and recovery, as a modifying agent for other plastics, or as an additive to natural and synthetic rubbers to improve processibility, increase water vapor and gas barrier properties, and otherwise modify the physical properties. The practical aspects of compounding with coumarone-indene resin have been given further attention (111). Specifically formulated phenolic resins have two major uses in the rubber industry—rubber compounding and solvent-type adhesives (112). Such resins, which act as thermosetting plasticizers, are completely compatible with the butadiene-acrylonitrile elastomers and impart to such rubbers high tensile strength and hardness; improved resistance to abrasion, solvents, and oils; and excellent surface finishes. A different approach is based on combinations of such modified phenolic resins with butadiene-acrylonitrile rubber to plasticize and modify the resin itself (113). This points the way to many new and improved applications. A detailed German study deals with a number of practical compounding problems including mixtures of synthetic elastomers to give better properties, the effect of softener addition, and the effect of litharge on cure rate (114).

Rubber Fabrication Studies

Recent developments in rubber and plastics machinery have been comprehensively reviewed with particular reference to the two-roll mill, the internal mixer, the continuous screw mixer, calenders and calender auxiliary equipment (115). The extent to which the rubber industry depends upon instrumentation has been discussed; pointed out is the utility of special devices including electronic control besides the usual plant instrumentation (116). Specific use of electronic control in golf-ball winding operations has been reported (117). Of interest to the engineering profession is the study on the design and construction of arc welded steam platens which won an award in a recent Design-for-Progress Award program in the industry machinery division (118).

Modern tire-making methods have been reviewed with a flow sheet covering operations in a specific plant (119). The latest developments in injection molding of rubber goods (120) and the application of high-frequency dielectric heating (121) have been covered. Special attention has been given to quality control through design of equipment, raw material selection, processes, and methods, inspection and testing of finished products (122). Consideration has been given to health protection and safe operating conditions in the rubber industry (123-128); covered are such subjects as toxicity of materials, ventilation control, isolation of hazardous operations, and fire hazards in cement handling.

Testing

Considerable attention has been given to improving standard tests and techniques for testing rubber and the application of statistical methods in interpreting the results (129-136). More work has been done on the determination of unsaturation of elastomers by halogen reactants (137-139). Perbenzoic acid has been used in the quantitative measurement of internal double-bonds (140). Further studies have been made on the molecular weight and structure of rubber polymers (141-147). Crystallization and optical properties of rubber under conditions of stress have been given attention (148-151). An X-ray method has been described for studying the mixing, distribution, and size of sulfur and filler particles in rubber mixes (152). New techniques and procedures have been developed for testing latex (153-158) including such factors as electrophoretic mobility, strainability, dispersoidal analyses, and systematic organic analysis. A comprehensive study has been made of the testing and grading of wild and plantation rubbers (159). Methods have been proposed for the quantitative determination of the elastomer composition of rubber mixtures (160-161). A practical method for estimating the amounts of GR-S and natural rubber in reclaims containing these two polymers has been worked out (162). Measurements of elongation of rubber vulcanizates at a fixed stress form the basis of a new strain test of a high degree of accuracy (163). A graphical presentation shows the relation between Mooney viscosity and Williams plasticity (164); while a new apparatus has been designed for evaluating the moldability of rubber mixtures (165). A continuation of a study on abrasion covers such subjects as the influence of softeners, the influence of grain in tire treads, the durability of abrasive wheels, the influence of type of abrasive, and the value of an abrasive index (166).

Recommendations have also been made to improve the precision of cut-growth tests for GR-S vulcanizates (167). Research studies aimed at improving and standardizing flex-cracking tests (168, 169) discuss types of tests, factors influencing the test, and accuracy of test results. The necessity for improving the degree of uniformity of test specimens is emphasized. Various factors influencing results of hardness tests of vulcanized rubber have been described (170). Surveys have been made on accelerated aging tests (171-172), and the separate evaluation of the effects of water, oxygen, sunlight, and ozone have been correlated for forecasting the behavior of rubber compounds under various weather conditions (173). In order to test rapidly white or light-colored rubber for staining or bleeding characteristics a new apparatus that permits rapid evaluation has been devel-

oped (174). A method has been described for the experimental determination of dynamic viscosities and elasticities and the relaxation of rubber (175). The Roelig hysteresis machine was developed to simulate more closely the deformations and strains undergone by rubber during its service life than that achieved by conventional types of apparatus (176). A twin transducer has been developed for measuring the dynamic viscosity and rigidity of rubber-like solids in small oscillating deformations (177). This instrument is said to have two advantages over the usual resonance devices: (a) the amplitudes of motion, which need not be measured directly, are extremely small, thus minimizing any non-linear effects or temperature change due to heat dissipation; (b) a continuous range of frequencies spaced as closely as desired is available without adjusting masses. An acoustical determination provides the necessary relations for computing Young's modulus and the associated viscosity coefficient (178). The electrical testing of rubber has been given attention in two different studies (179-180). A burst test apparatus for rubber has been developed (181). A joint project has resulted in an instrument for measuring the slipperiness of walkway surfaces (182). Behavior of rubber at low temperatures has become an increasingly important subject. The complications involved in evaluating behavior of rubber at low temperatures are stressed, and the need of standardization has been emphasized (183).

In a contribution on the testing and evaluation of tire cords an attempt has been made to find the causes of cracks in tire carcasses, and details have been offered of an apparatus for testing cords for rubber fatigue (184). Hysteresis, elastic modulus, total growth, and growth rate of tire cords have been measured under conditions of rapid cyclic loading (185). Three techniques are reported for estimation of rubber in treated fiber products (186). As an adjunct to normal inspection procedure, an X-ray test is used for examining finished tire quality (187). Utilizing rigid inspection technique, numerous samples of rubber hose have been examined and the types of defects have been classified into major and minor types according to their severity (188), and it is recommended that this type of study be extended to other rubber items.

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Latex

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(To be continued)

High-Tenacity Rayon

(*Continued from page* 591)

strength is of advantage, particularly in the former application. "Fortisan" aircraft tires can be made lighter, thus increasing the pay load for each trip undertaken. Thinner fabrics give lighter and more flexible carcasses, a factor which increases resistance to the fatigue of high-frequency flexing. For tires, it has usually been assumed that a cord construction is necessary because mechanical extension is found essential as a means of increasing fatigue resistance. It remains, however, for the manufacturer to choose a balance between strength and extension, and a wide range of these properties can be made available. This is illustrated in Table 7. The use of single yarns instead of cords should not be excluded because these also can be suitably twisted to give a range of strength and extensions.

TABLE 7. TYPICAL CONSTRUCTIONS OF "FORTISAN" TIRE CORDS, ILLUSTRATING EFFECT OF TWIST ON STRENGTH AND EXTENSION

Cord Den.	Twist, T.P.I.	Resultant Den.	Breaking Load, Lbs.	Tenacity, G./Den.	Extension at 10 Lbs. Load, %	Extension at Break, %
1100×2, high "stretch"	13Z×13S	2480	19.2	3.5	7.2	11.3
1100×2, intermediate	11Z×11S	2360	25.4	4.9	4.0	16.0
11×2 low "stretch"	8.5Z×5S	2200	27.0	5.6	3.0	8.0
733×3, intermediate	12Z×10S	2302	26.5	5.2	4.0	10.0
2200	8Z	2440	24.2	4.5	3.0	7.0
2200	10Z	2500	17.2	3.1	4.6	7.0
1100×3, intermediate	13Z×10.5S	4000	30.9	3.5	5.5	12.0

The application of "Fortisan" to V-belt drives and transmission belting is very similar to its use in tire and conveyer belting so that this part of the subject requires no special consideration. The dimensional stability of "Fortisan" makes it particularly suited for exploitation in other rubbered goods, such as footwear, rainwear, fire hose. The uniformity and the cleanliness of the yarn make it valuable for use in diaphragms and printers' blankets; while rubber-treated cords find a useful outlet in the disk-ruling machines of the printing trade. It is also in use as a supporting medium for rubber sheet because, when suitably prepared, it is easily stripped. Many other uses no doubt will suggest themselves, particularly in view of the fact that the material can also be supplied in staple form, cut to any desired length. In both staple and continuous filament form "Fortisan" is used in various forms of plastics and, when used as a reinforcement for phenolic laminates, results in laminate boards of substantial superiority.

Table 8 gives a comparison of the mechanical properties of laminates prepared from a square-woven "Fortisan" cloth with a weight of 4.9 oz. sq.yd. and a standard good-quality cotton duck. A spirit-soluble phenol-formaldehyde resin was used in each case. It will be seen that the substitution of "Fortisan" for cotton results in approximately 25% increase in shear strength and 100% increase in tensile strength, cross-breaking strength, modulus of elasticity, and impact strength.

TABLE 8. MECHANICAL PROPERTIES OF "FORTISAN" AND COTTON LAMINATES. RESIN—PHENOL FORMALDEHYDE—SPIRIT SOLUBLE

Property	"Fortisan"	Cotton
Resin content	50%	50%
Specific gravity	1.38	1.35
Water absorption, mgm	102	149
Tensile strength, lbs. in.^{2}	22500	10500
Cross breaking strength		
Flatwise, lbs./in.^{2}	30500	16500
Edgewise, lbs./in.^{2}	26000	15800
Shearing strength		
Flatwise	15000	12700
Edgewise	15000	12250
Modulus of elasticity (in tension) lbs./in.^{2}	1.70×10^6	0.86×10^6
Impact strength, ft. lbs.		
Flatwise	12.5	5
Edgewise	5	4
Hardness—Rockwell M. scale	115	108

When water-soluble resins are used instead of spirit-soluble resins, the products obtained are stiffer (higher modulus of elasticity and low water absorption) and are lower in impact strength than the corresponding spirit-soluble "Fortisan" laminates.

In conclusion, the writers would mention that though "Fortisan" has been in commercial use for more than ten years and did important work during the war years, particularly in the form of parachute fabrics and cords, this occasion is the first on which the properties and uses of the material have been described at length to a technical audience.

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"American Standard Letter Symbols for Physics, ASA Z 10.0-1948." American Standards Association, 70 E. 45th St., New York 17, N. Y. Available from American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. 38 pages. Price $1. This is a compilation of standard letter symbols for use in technical and scientific writing, prepared by a committee sponsored by five engineering societies. All common terms in elementary physics and some in advanced physics and related fields are included.

EDITORIALS

Continued Progress in Synthetic Rubber

DEVELOPMENTS in connection with improvement in the quality of GR-S have proceeded at an accelerated rate during the past several months. In January somewhat more than the usual number of statements were made by authorities in the field, a consideration of which leads to the conclusion that 1949 might be a banner year for progress in synthetic or chemical rubber.

It was of special interest to note that the Office of Rubber Reserve, RFC, through an article by G. B. Hadlock, John T. Cox, Jr., and O. W. Burke, in the January 3 issue of the American Chemical Society publication, *Chemical and Engineering News*, are now on record in support of tire industry statements on the value of "cold rubber" for improved tread wear. Low-temperature GR-S has shown a 25% improvement over standard GR-S when used as a tire tread stock, and new carbon blacks for special use in synthetic rubber have improved tread wear performance an additional 25%. Thus the combination of new synthetic rubber and new carbon blacks has resulted in tire treads of substantial performance improvement over natural rubber.

The Goodyear Tire & Rubber Co. issued a press release on January 5, signed by R. P. Dinsmore, entitled "Synthetic Rubber Status." It was stated that low-temperature GR-S gives a very marked improvement in tread wear as against GR-S of perhaps 30%, which would raise it to, or somewhat above the level of natural rubber. The conclusion that the whole synthetic rubber problem has been solved must be regarded as premature, since among other things there is no prospect of improved value in large truck tires. Dr. Dinsmore takes the position that nothing yet has appeared to indicate that synthetic rubber can compete in cost with natural rubber, on a free market, with ample supply.

Most manufacturers of rubber products have about the same attitude with regard to "cold rubber," according to a report to the Committee on Armed Services of the House of Representatives by professional staff member John R. Blanford. This report made public in January had to do with an inspection of government synthetic rubber plants, but included comment on low-temperature GR-S. The general opinion of both large and small manufacturers was said to be one of cautious optimism. Everyone seems agreed that the new "cold rubber" is superior to the old GR-S, but insofar as its performance is concerned there is some feeling that an insufficient length of time has elapsed for it to have conclusively proved itself.

This proof may be accumulated at a steadily increasing rate with both Dayton Rubber Co. and Lee Rubber & Tire Corp. indicating that their premium lines of passenger tires are being made with "cold rubber." Almost all tire manufacturers are known to be making as many tires with treads of "cold rubber" as the limited supply will permit. The supply situation should improve greatly during the second half of the year.

It may be possible to speed up the rate of production of cold rubber to a marked degree if a new polymerization catalyst recently announced by the Phillips Petroleum Co. could be used on a large scale. An improved 41° F. recipe involving a reaction time of 13-15 hours, as compared with the previous time of 16-22 hours, has been used by the Copolymer Corp. to produce more than 2,000,000 pounds of "cold rubber." A reaction time of two to three hours has been achieved in small-scale experiments.

Other interesting points made by Phillips Petroleum are that the new catalyst might lower the cost of "cold rubber" through the use of less costly ingredients, and that at some time in the future full advantage may be taken of this new development in new plants designed for handling fast reactions.

Termination of the patent pooling agreement on synthetic rubber and a solution to the problem of the disposal of some government plants may develop in the course of the next few months. If so, synthetic rubber may make spectacular progress in 1949.

"Fair Trading" of Premium Tires

IT IS just possible that tire manufacturers should look again at the invitation of the Seiberling Rubber Co. to join in the announced intention of that company to place its premium-level passenger-car tires and tubes under fair trade restrictions in all states where fair trade laws are in operation.

The primary purpose of the Seiberling company is to limit price cutting and downgrading of quality in the tire field. Fair trading requires the manufacturer to establish the lowest "fair" retail price for his products and also to adhere to a quality standard established for the brand.

Retail tire selling in the past has been marked by sharp price cutting on numerous occasions, with the result that the selling price has often been reduced below the manufacturing cost.

Tire manufacturing is probably one of the best examples of a field in which large sums of money are regularly spent on research and development in order to produce an improved product without the manufacturer being able to obtain a reasonable return on this expense in terms of increased net income.

One way to improve this situation and avoid a repetition of income destroying "price wars" might be for the majority of tire manufacturers to support the move by the Seiberling company by also placing at least their premium-grade passenger-car tires and tubes under fair trade restrictions wherever possible. Adequate income in tire making may be difficult to maintain otherwise.

DEPARTMENT OF
PLASTICS TECHNOLOGY

Hard Chromium Plating of Plastic and Rubber Molds[1]

J. C. Rogers[2]

THIS paper is designed to provide some fundamental information on the use of hard chromium plating to preserve rubber and plastic molds and obtain better molding. Hard chromium plating, as distinguished from the softer decorative types, is a field still under development and occupies much of the status of an art at present. Because of the difficulties involved in plating complex mold surfaces and the use of a dark colored plating solution which prevents inspection of the work during plating, much of the work is done on the basis of past experience modified to fit the particular piece being plated. The necessity of using a specialist to perform such work is therefore apparent.

When properly applied, a hard chromium plating is many times harder (approximately 1,000 Brinell) than the base metal of the mold and will greatly prolong the life of the mold. Hard chromium is plated directly to the base metal without the use of copper or other intermediate electroplated layers to form the bond. In fact, if such intermediate layers are used, the hard chrome will be just a decorative plate and not stand up under the extreme service conditions that prevail during molding.

Mold Preparation

The polishing and preparation of molds prior to hard chrome plating is one of the most important factors to both the plater and the molder since the chromium finish will reflect the surface finish of the steel being plated. The steel surface must be given the desired finish prior to plating since the chromium plate will not fill in any pits or scratches that may exist on the mold surface.

Most molds are worth hundreds and even thousands of dollars and my company therefore prefers that the polishing be done by either the mold owner or by an established tool and die shop. Mold polishing is a precision job; if a very sharp edge of a mold were rounded in polishing, the mold would be badly damaged and might even require scrapping. After a mold has been designed and completed it is normal practice to make "test shots" to check the molded objects against the specifications. If these shots are up to expectation and no further machining is required, the mold is then ready for polishing before hard chrome plating.

All pits, scratches, fire scale oxidation, rubber and plastic particles, and other foreign objects on the mold surface must be removed by polishing with orange sticks, rouge, or similar material. Particular attention and effort should be given to corners, crevices, knurls, undercuts, and steps in the molding area since these areas are hard to polish and particularly hard to plate. The mold surface must be thoroughly clean, or the plate will have either a milky color or else be deposited discontinuously.

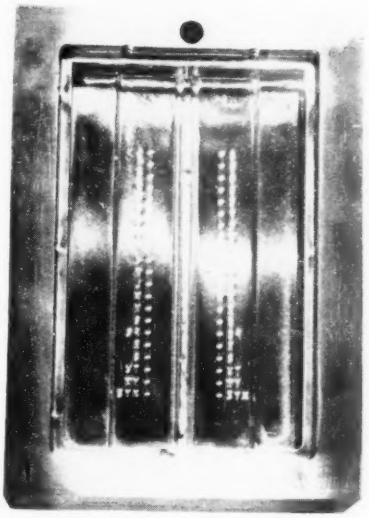

Fig. 1. Hard Chrome Plated Cavity Used by Mack Molding Co. to Mold Plastic Telephone Index Covers

The appearance of milky spots on an otherwise shiny chromium plate surface is caused by a residual film of lubricant or rust-preventative oil on the mold before plating. Under proper procedures the steel mold is given both solvent and electrolytic cleaning operations to remove such film and other foreign material and to secure better adhesion of the deposited chromium coating.

There are several ways to obtain a uniform high luster or mirror finish on the mold surface; one of the most common is the use of orange stick and elbow grease. The final operation of steel coloring is usually done with a dental polishing head or small rag wheels using rouge or similar material. This polishing and preparation of mold surface must also be done before hard chrome plating molds which have already been in use.

Vapor Blasting

In cases where a mirror finish on the mold surface is not desired, such as on the forces that form the inside of a molded object, it is common to ask for vapor blast or liquid honing. When a vapor blast is desired, it is not necessary to polish the parts at all, in many cases we receive the parts unpolished and with scale on them. The vapor blast consists of a fine-mesh grit in water at a very high pressure and will remove scale, oxidation, and foreign matter other than plastic or rubber particles from mold crevices.

Since the blast is vaporous instead of dry, the blasted surfaces become virgin metal with absolutely no damage to the part at all. Even the sharpest edges remain sharp, and the treatment does not distort the molds or blasted articles in any way. We can vapor blast a mold in a few minutes; whereas polishing it would require several hours or even days. A blasted surface has a light-gray luster or very high mat finish. Even when a bright mirror finish is required we often vapor blast the mold surfaces prior to polishing and thus reduce polishing time by two-thirds or more.

In certain types of plastic and rubber molding where a very high luster is unnecessary, we hard chrome plate the mold surfaces 0.0002-0.0005-inch thick in accordance with specifications. After a part has been given such a plate the luster remains mat, but is lighter than before beause of the plate deposit. Plating luster is quite attractive in such cases, but does not have the light reflection value of a plate deposited on a polished surface. Rubber molders usually request the mat finish plating since, after all, a polishing job is a purely optical effect since it consists of series of very tiny scratches that reflect light.

Plating Thickness

Plastic molds, forces, pins, etc., usually require a 0.0002-0.0003-inch thick hard chrome plating, although we often apply a plate thickness of 0.0005-inch in large cavities. On the other hand, a plate thickness of 0.0005-inch is standard for rubber molds, forces, pins, etc.

We are often able to salvage a cavity or mold that is oversize in the molding area by applying a much heavier hard chrome plate running into several thousandths of an inch in thickness. This question of salvage should be thoroughly discussed with the plater. There are several ways of doing plate salvaging satisfactorily, depending on the contours of the molding surface and the design, plus plain good sense and the know how of the plating personnel. No matter what your problem may be in plating, I suggest that you take it up with the plater. In most cases he can get you out of your difficulties by bringing back a costly part that may have been scrapped because of faulty machining or other reasons.

Typical Applications

Figure 1 shows a hard chrome plated mold used by Mack Molding Co. for molding plastic telephone-number index covers. This particular cavity and many others have been in service several months. These cavities were polished, given an original hard chrome plate of 0.0002-0.0003-inch thickness, and used in service until worn.

[1] Presented before New York Section, Society of Plastics Engineers, New York, N. Y., June 8, 1948.

[2] Sales manager, Industrial Hard Chromium Co., Rome St. & Wilson Ave., Newark 5, N. J.

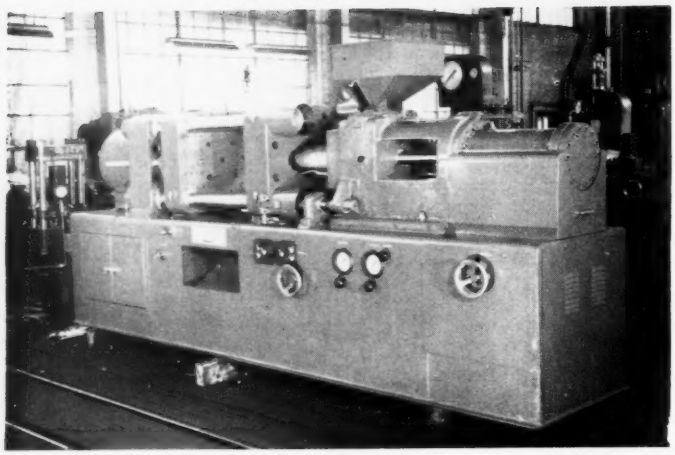

Fig. 2. Watson-Stillman Co. 28-Ounce Injection Machine with Hard Chrome Plated Cylinder, Torpedo, and Nozzle

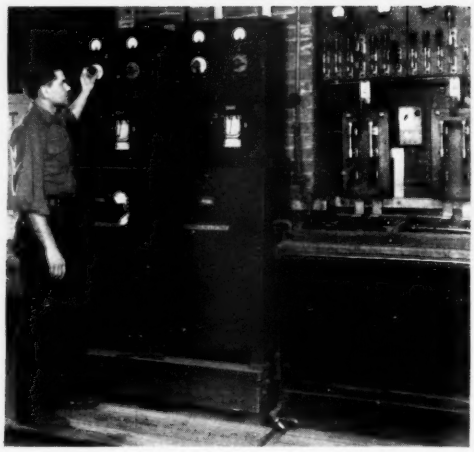

Fig. 3. Typical Hard Chrome Plating Installation

The original plate was then stripped off and the cavities repolished and replated.

This plating-stripping-replating procedure just goes on and on with little or no wear to the cavity itself, since the plating takes the wear. The age of some of these cavities is surprising. Every cavity, core, pin, and other mold part owned by Mack Molding Co. is hard chrome plated, and the company takes great pride in the ability of its tool room to maintain high molding efficiency at all times.

In the rubber industry little or no mold lubricant is needed if the mold is hard chrome plated. This saving in lubrication and mold cleaning time and labor holds true for both hard and soft rubber molds. Hard chrome plating gives sharp and perfect reproduction of molded parts from engraved or raised mold surfaces, such as letter, trade marks, etc. In addition to preserving the mold, hard chrome plating of threaded rubber molds, both internal and external, gives threads that reproduce perfectly without pickup of material, release readily from the mold, and possess high luster.

Figure 2 shows a 28-ounce Watson-Stillman injection molding machine whose cylinder, torpedo, nozzle, etc. have been hard chrome plated. The Watson-Stillman Co. demands the best in materials, engineering, and craftsmanship, and requires that all cylinders, torpedoes, nozzles, etc. in its molding machines be hard chrome plated to insure trouble-free service in the field.

Figure 3 shows one of my company's hard chrome plating installations.

Plating Operations

Perhaps the best way to describe the operations involved in hard chromium plating would be to follow a part through our plant. The part enters our plant at the receiving room where the receiver, who himself has plating experience, inspects the part and discusses it with the molder. If the molder is not too familiar with plating or if any problems arise, further consultations are held with our engineers until a definite understanding is reached by all concerned. The part is then given a tag stating the plating thickness desired, if a stop-off is necessary, and whether or not the part is to be stress relieved after plating.

If the part requires liquid honing, it is taken to the vapor blast machine for treatment and then sent to the set-up department; whereas if it is already highly polished, it goes direct to set-up. If the part is intricate, an anode is tailor-made to fit its exact contours. When inside surfaces are to be plated, the anode is made slightly smaller than the mold. The anodes are made of antimony or chemical lead, and in some cases as many as 50 or more anodes are used for one part in order to obtain uniform plating thickness. Anodes vary greatly in size and shape, ranging from a pin point to the exact size of a very large radio cabinet mold. When multiple anodes are used, their positioning is a precision job since they will cause rough spots in the finished plate if placed too close to the part.

In hard chrome plating the anode acts as the positive pole, and the part being plated is the cathode or negative pole. Unlike the plating of copper, nickel, zinc, and many other metals, there is no chromium anode used in hard chrome plating; the chrome is deposited electrolytically.

There are several hard chromium plating solutions in use. In addition to other ingredients, they vary in content between 30 and 44 ounces per gallon capacity of chromic salts, have a 100:1 ratio of chromic salts to sulfuric acid, and operate at 120-132° F. The mold, which acts as the cathode, is secured to the bottom of the plating rack in such a position as to be submerged a few inches below the surface of the plating solution. The anode is lowered into the mold so that all given distances between it and the mold are uniform. Contacts are then made on the anode bars across the top of the plating rack to complete the circuit. The traveling crane picks up the rack and lowers it into the plating cell or tank, depending on the size of the part.

The ordinary plating thickness deposited per plating hour is 0.001-inch for an outside diameter and 0.0005-0.0007-inch for an inside diameter and is dependant on the anode-cathode ratio in square inches. The reverse current switch is thrown on for a few seconds; the length of time depends on the type of metal being plated. Reversing the current cleanses and momentarily opens up the pores of the metal to allow for plating. The big master switch is then thrown on plate, and current is applied to the metal and increased by rheostat until the proper current density is obtained.

On most jobs the current runs around three amperes per square inch depending on the shape and size of the work and the judgment of the plater. The current enters the rack through the anode bars across the top of the rack and travels down the stems to the anode. The unmasked sections of the cathode or mold attract the amperage of the anode, and the current leaves the anode, deposits chromium on these unmasked sections, then goes through the bottom of the rack, up the cathode bar, and out to complete the circuit.

If the mold is highly polished and the current density right, the mold luster is very high and is magnified by the plate, and little polishing is needed to bring out the chrome color. When the plating rack is hoisted from the plating tank, the anode is raised, and the mold unfastened from the rack. The mold or other plated part is then rinsed and measured with a micrometer or other gage to check the plating thickness.

The mold is then inspected for blisters, light spots, or defective plating. If the mold passes the rigid inspection, it is then oiled to prevent the unplated areas from rusting.

If the mold is a salvage job and requires several thousandths of an inch of plate, it is given a final stress relieving treatment consisting of immersion into heat-treating oil at 360° F. for three hours in order to relieve hydrogen embrittlement of the metals. Plated stock should never be annealed because the chromium will adhere to the pores of the base metal and will be very difficult to strip off in the future. If it is discovered that a plated mold must be annealed to allow for further machining have your plater strip off the chrome first.

Plated molds should be ground very slowly; shallow cuts should be used, or surface cracking of the chrome plate will occur, and the plate will flake off. In some cases cracking of the base metal may also occur and form a checker-board surface finish. For polishing the chromium plating the use of a very soft stone to remove fuzzy edges is recommended.

Plate Stripping

Hard chromium plated molds can be stripped and replated many times, if done properly. Stripping can be done with a 50% solution of muriatic acid in water which removes only the plating and does not damage the base steel. Improper stripping may sometimes cause surface passiveness of the steel base, which must then be refinished prior to replating. We do not recommend that plating be stripped electrolytically since this procedure may often

either badly pit or damage the part beyond repair.

Summary and Conclusions

When properly applied, a hard chromium plating is many times harder (approximately 1,000 Brinell) than the base steel being plated and will greatly prolong the life of a mold, whether used for plastic or rubber molding. When worn down, the plating can be stripped off, and the mold repolished and replated for further service. If done properly, this cycle of stripping and replating can be performed almost indefinitely since the plating takes the wear of molding and the mold remains unaffected. The plate surface reflects the finish of the base metal, and the proper cleansing and polishing of the base surface is therefore an important factor in obtaining a satisfactory job.

It should be emphasized that hard chromium plating is still pretty much of an art and requires the services of an expert and experienced plating shop. Each part to be plated must be considered as an individual problem and handled accordingly. My company will welcome the opportunity of serving you in your particular plating problem.

SPE Holds National Conference; Sections' Regular Meetings

THE Society of Plastics Engineers held its fifth annual technical conference on January 19 to 21 at the Bellevue-Stratford Hotel, Philadelphia, Pa., with a registration of 420 and a total attendance of approximately 600 members and guests. The conference, acclaimed by all as the most successful in the Society's history, featured a three-day program of technical papers, the Society's annual luncheon and business meeting, and displays by 29 participating companies.

Abstracts of papers presented during the technical sessions appeared in our January issue. The morning session on January 20 featured the delivery of the winning papers in the 1948 SPE prize paper contest. First prize of $200 was won by A. R. Morse, Reed-Prentice Corp., for his paper, "Empirical Factors in Injection Machine Design." Second prize of $100 was taken by the paper on "Hot Air Preheating of Compression Molding Powder: A Method and an Apparatus," by Ronald D. Beck, Continental Can Co. The third prize of $50 was shared by Irving Silver, Naval Ordnance Laboratories, for his paper on "Shear Impact and Shear Tensile Properties of Adhesives," and Warren Prince, consulting engineer, for his paper, "Basic Laws of the Plastic Molding Process."

Business Meeting

The business meeting on January 20 was presided over by retiring President J. H. DuBois, Shaw Insulator Co., who announced the new SPE national officers for 1949, as follows: president, Mario J. Petretti, Noma Electric Corp.; vice president, William J. Dunnican, Borden Co.; secretary, M. Scott Moulton, B. F. Goodrich Chemical Co.; and treasurer, E. Todd Clark, Burkhart Mfg. Co.

Mr. Petretti announced the appointment of the following national committee chairmen: professional activities, M. R. Gerow, Reynolds Metals Co.; auditing, R. L. Davis; by-laws and rules, Mr. Dunnican; credentials, R. B. Bishop, Socony-Vacuum Oil Co.; education, L. F. Rahm, Princeton University; financial, Mr. Clark; 1949 prize paper contest, G. W. Clark, Owens-Illinois Glass Co.; meetings, H. McGowan; public relations, Spencer Palmer, Tennessee Eastman Corp.; publications, Mr. Moulton; publicity, William Schack; and membership, L. F. Hansom. The chairmen of the election inspectors, placement, historical, and speakers committees will be announced at a future date.

Reports by the chairmen of the various 1948 committees were then heard. Mr. Bishop, speaking for Mr. Petretti as chairman of the credentials committee, suggested the establishment of a professional grade membership in the Society. This membership and changes in the SPE constitution recommended by Mr. Dunnican, chairman of the by-laws and rules committee, were approved at the meeting and will be confirmed by letter ballot by the entire membership. T. E. Orr, chairman of the membership committee, reported that the SPE had gained 239 members during 1949 and now had a total membership of approximately 2,300. A new Connecticut Section has been established, and the founding of five new sections is under consideration.

Exhibits

Most of the engineering exhibits shown in conjunction with the Conference were displays by materials manufacturers, including Acryvin Corp., American Cyanamid Co., Bakelite Corp., Durez Plastics & Chemicals, Inc., Hardesty Chemical Co., B. F. Goodrich Chemical Co., Inland Plastics of America, Inc., Glenn L. Martin Co., National Vulcanized Fibre Co., Nixon Nitration Works, Naval Ordnance Laboratories, Naval Air Materiel Center, Synthane Corp., Synvar Corp., United States Rubber Co., and Wolverine Plastics, Inc. The U. S. Rubber display, by the engineered rubber products division at Ft. Wayne, Ind., featured the first public showing of Enrup, a new thermo-setting plastic for use in gears and other industrial applications.

Displays of machinery and services were made by Art Roll Leaf Stamping Co., Elgin National Watch Co., Industrial Radiant Heat Corp., Moldern Plastic Machinery Co., Newark Die Co., Payne & Craig Corp., Plastic Engineering, Inc., Spectrum Mfg. Co., and F. J. Stokes Machine Co.

New SPE National Officers, *(L. to R.)*, W. J. Dunnican, M. J. Petretti, and M. S. Moulton

Joint Newark-New York Meeting

The Newark and New York sections, SPE, held their first joint meeting of the year on January 12 at the Newark Athletic Club, Newark, N. J. "Selecting the Right Plastic Material" was the subject of the meeting, which was attended by approximately 135 members of the two sections. "General Consumers' Problems" were discussed by Robert Burns, Bell Telephone Laboratories, and "Specific Problems Relating to Military Requirements" were discussed by Emile Beekman, Signal Corps Engineering Laboratory, Fort Monmouth.

Mr. Burns gave a general talk on misapplication of plastics and their effect on the public. There are no bad plastics, only bad applications, he said, and these can be eliminated by proper examination of operating requirements for any plastic part. He urged that the following three requirements be maintained for every plastic piece regardless of its selling price: (1) dimensional stability and resistance to shrinkage; (2) reasonable strength, particularly impact strength; and (3) reasonable heat resistance.

Mr. Beekman began his talk with a discussion of general military requirements for plastic parts. These requirements are more severe than those of civilian applications because of climatic changes, long storage often under adverse conditions, greater physical abuse in handling and transportation, and the need of greater heat dissipation because of high operating speeds. The speaker then passed on to Signal Corps requirements for their plastic parts which are used in electrical apparatus. Samples of various parts and assemblies were displayed and discussed, and suggestions for further improvements in the design and materials used were requested.

In the business session preceding the talks, the retiring Newark president, J. T. Growley, Celanese Corp. of America, announced the new officers and directors of the group for 1949, as follows: president, H. E. Frutchey, Thomas Mfg. Co.; vice president, R. B. Akin, E. I. du Pont de Nemours & Co., Inc.; secretary-treasurer, Ed Soules, Detroit Mold Engineering Co.; and directors, (three years) George Frackenpohl, Newark Die Co., Gene Fortney, Fortney Mfg. Co., and Pete Simmons, Dow Chemical Co.; (two years) Mr. Akin, Mr. Soules, and Gil Peakes, Bakelite Corp.; and (one year) M. R. Gerow, Reynolds Metals Co., T. S. Taylor, U. S. Testing Co., and Mr. Growley. Islyn Thomas, Thomas Mfg Co., is national director for the Section.

Joint Meeting Held in Chicago

Approximately 90 members and guests of the Chicago Section, SPE, and Midwest Chapter, SPI, attended a joint meeting on January 12 at the Builders' Club, Chicago, Ill. The SPI sound motion picture, "A Scientific Approach to Better Plastics," depicting results of the Massachusetts Institute of Technology project sponsored by the Plastic Materials Manufacturers' Association, was shown, and George H. Clark, Formica Co. and president of SPI, spoke on the reasons for starting the M.I.T. project, progress made to date, and the need of correlating the physical properties of plastics with their basic chemical structure. William T. Cruse, executive vice president of SPI, also spoke on the value of organizations such as SPE and SPI to the plastics industry.

Another feature of the meeting was a round-table discussion, "Should the Chicago

Molders Adopt the Miami Valley Molders Plan?" This plan would involve the setting up by the local SPE section of a program of testing raw materials to aid smaller plastics molders and fabricators. After a lively discussion, moderated by William L. Hess, Anesite Co., it was decided to continue further consideration of the plan at a future meeting.

New York Section Elects

The New York Section has announced the election of the following officers and directors for 1949: president, Stanley Bindman, Noma Electric Corp.; vice president, Sam Silberkraus, Regal Molding Corp.; secretary-treasurer, George Barron, Ideal Plastics Corp.; national councillor, Nicholas V. Fasano, Washington Molding Co., Inc.; and directors, (three years) Mr. Barron, Edward V. Walsh, Tech-Art Plastics Co., and Bruno Wessinger, Wess Plastic Molds, Inc.; (two years) George Rice, American Cyanamid Co., Palmer Humphrey, consultant, and Mr. Silberkraus; and (one year) Mr. Bindman, Mr. Fasano, Saul Blitz, Noma, and Arthur Nufer, Bakelite Corp.

The following committees have been appointed: publicity and program, Mr. Humphrey (chairman), A. M. Merrill, India RUBBER WORLD, Herbert Proske, Wheelco Instruments Co., and Arthur S. Jacobs, Renwal Mfg. Co., Inc.; membership, Mr. Rice (chairman), Sam Stone, Eagle Plastics Corp., and Robert Boucher, Bakelite; and house, Mr. Walsh (chairman), Mr. Boucher, Mr. Wessinger, Leo Adenbaum, Accurate Molding Corp., Joseph A. Joyce, Plaskon Division of Libbey-Owens-Ford Glass Co., and Mr. Fasano.

Ladies' Night at Buffalo

Approximately 40 members and their wives attended the Christmas party of the Buffalo Section, SPE, on December 17 at the Park Lane Restaurant, Buffalo, N. Y. The party began with a cocktail hour, followed by a dinner and an evening of dancing. Miss Elizabeth Stout, director of retail education for Celanese Corp. of America, spoke after dinner on the use of Celanese textiles and plastics in fashions and home furnishings. Miss Stout used sample fabrics and plastic products to illustrate her talk. A drawing for a door prize also was held, and table favors, consisting of Lumarith cellulose acetate knitting boxes, supplied by Cox Plastics, Inc., were distributed to the ladies present.

SPE-SPI Joint Calif. Meeting

The Southern California Section, SPE, and Pacific Coast Section, SPI, held a joint dinner-meeting on January 20 at Scully's Cafe, Los Angeles. Approximately 65 members and guests of the two groups heard J. V. Johnston, National Vulcanized Fibre Co., discuss "Thermosetting High-Pressure Laminates," and I. A. Young, Underwriters Laboratories, Inc., speak on "Design for Safety."

Mr. Johnston began his talk with a review of the origin and the development of high-pressure thermosetting laminates. The first laminate, developed in 1910, had a paper base and was closely followed by a cotton base-type for improved strength. Two years later an asbestos cloth-base laminate was developed for high heat resistance. The industry was given impetus by the first World War and has developed rapidly since that time.

Total production of high-pressure thermosetting laminates today is approximately 150 million pounds and is divided between four fields of application: decorative; refrigerator parts; other mechanical uses; and electrical. New developments being worked out by Joint Army-Navy Commission 13 in cooperation with industry will further broaden these applications, Mr. Johnston said. At present there are more than 100 separate and distinct grades, and many of these resulted from developments in the field of catalysts. Development of standards and engineering data began in 1915, and now, through the efforts of NEMA and ASTM there are well-established standards on many properties of these laminates.

Mr. Young's talk, a brief review of the functions of Underwriters Laboratories in reducing the fire hazard from electrical equipment, included the showing of a film, "Approved by Underwriters," which illustrated actually testing procedures.

Reinforced Plastics Meeting

THE Reinforced Plastics Division of the Society of the Plastics Industry, held its fourth annual technical session and exhibit on January 12 to 14 at the Edgewater Beach Hotel, Chicago, Ill. Approximately 195 representatives from industry and government attended the meeting, which featured morning technical sessions, luncheon and dinner, and displays of reinforced plastic products by some 29 companies. A special feature of the meeting was a "personal contact" period each afternoon when an effort was made to bring together representatives of resin and filler manufacturers, mold and machinery producers, designers, consultants, molders, and fabricators.

The morning technical session on January 12 was presided over by J. A. Owen, Sorg Paper Co. A paper on "Organic Peroxides as Catalysts for Polyester Type Resins" was given by C. H. Rybolt and T. C. Swigert, Lucidol Division of Novadel-Agene Corp. This paper covered catalyst requirements, properties, selection, concentration, and handling from the viewpoint of results obtained in commercial use. Four papers were presented on the general subject of "Surfacing of Reinforced Plastics," as follows: "Decorative Surfacing of Reinforced Laminates," T. W. Noble, Morart Gravure Co.; "The Manufacture and Properties of Plastic Surfaced Plywood," N. G. Bull, Kimberly-Clark Corp.; "Molded Finishes," C. E. Bacon, Owens-Corning Fiberglas Corp.; and "Surface Coatings for Reinforced Plastics," P. O. Blackmore, Interchemical Corp.

Harold Freeman, American Cyanamid Co., presided over the luncheon on January 12. SPI President G. H. Clark, Formica Co., spoke on "The M.I.T. Project and the Need of Standardization," and there was a showing of "The Scientific Approach to Better Plastics," the SPI film on the M.I.T. project sponsored by P.M.M.A.

The January 13 morning technical session consisted of a round-table discussion on "Applications and Economics of Reinforced Plastics," led by R. B. White, Laminated Plastics, Inc., Leonard Meyer, Western Products, Inc., presided over the luncheon session at which two papers were presented: R. W. Kolderman, Dow Corning Corp., spoke on "Silicones, New Engineering Materials," and E. M. Beavers, Resinous Products Division of Rohm & Haas Co., discussed "The Basic Chemistry of the Polyester Laminating Resins." The divisional banquet in the evening saw R. J. Brinkema, Egmont Arens, Inc., acting as toastmaster; while James Swan spoke on "It's a Great Life if You Don't Weaken —The True Experiences of a Marine."

A technical forum was held the morning of January 14, with W. B. Darling, Riegal Paper Corp., presiding. Technical questions from the audience on the subjects of new developments, materials availability, production methods, and other problems were answered by a panel consisting of F. L. Bennett, Bakelite Corp., S. A. Moore, Interchemical Corp., and Messrs. Bacon, Brinkema, Bull, Freeman, Meyer, Noble, and White.

New PMMA Officers

NEW officers of the Plastic Materials Manufacturers Association were elected at the annual meeting on January 13 at the Manhattan Club, New York, N. Y. D. S. Frederic, vice president of Rohm & Haas Co., was elected president of the Association, and Felix N. Williams, vice president of Monsanto Chemical Co. and general manager of the company's plastics division, was elected vice president. F. H. Carman and John E. Walker were re-elected secretary-general manager and treasurer, respectively.

New UBS Resin

ISOPOL, a new hydrocarbon resin of moderately high molecular weight, made up of approximately 75 parts styrene and 25 parts isoprene, has been developed by Union Bay State Chemical Co., Cambridge, Mass. The resin contains proportions of styrene and isoprene opposite to those usually found in synthetic rubber and appears to offer some very definite advantages in various applications where ester gum, paracoumarone-indene, and terpene resins are now used.

Now in pilot-plant production, Isopol Resin is clear, hard, nearly water-white in appearance, possesses many of the chemical properties of rubber, and is unique in that it is completely soluble in petroleum naphtha. It may be described as a modified polystyrene in which the isoprene acts as an internal plasticizer; thus the advantages of polystyrene, such as inertness, cost, color, etc., have been retained while the disadvantage of brittleness has been partially eliminated. The resin may be used in solution, emulsion, or solid form. It is available at present only in solid form, but may be offered in other forms if sufficient demand develops.

Isopol Resin is being molded at present into "window glass" for the motion picture industry since it will fracture without giving sharp edges. Another promising use for the resin is as a base in chewing gum where it can be blended hot with suitable materials to give it proper plasticity and flavor. A third possible application for the resin is as a stiffener for natural and synthetic rubber. By nature, the resin is close to rubber in chemical structure and can be milled and cured. A final possible use of the solid resin is as an ingredient in hot melt coatings. Possible applications for the resin in solution and emulsion forms include coating materials, tank linings, and waxes.

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Scientific and Technical Activities

High Polymer Physics Division, APS, Meeting, January 27-29

A MEETING of the Division of High Polymer Physics of the American Physical Society was held at Columbia University, New York, N. Y., January 27-29, as part of the meeting of the parent Society. A program committee under the chairmanship of Warren F. Busse, Institute of Textile Technology, had arranged for the presentation of more than 30 papers, abstracts of most of which are given below. Titles and authors of a few papers for which abstracts are not available are also given.

Sessions were held on the morning and afternoon of January 27 and 28 and on the afternoon of the 29th.

Abstracts of Papers

Velocity and Attenuation of Sound in Butyl and GR-S Rubbers.[1] Measurements were made in thin strips of rubber from 0.5 to 5.0kc, and from —5 to 90° C. to extend the temperature range of previous work.[2] Above room temperature velocity and attenuation are higher in Butyl gum than in GR-S. In all cases the velocity increases with decreasing temperature and increasing frequency. The attenuation shows a peak with temperature. For Butyl the peaks are broad and occur at higher temperatures than for GR-S. For both stocks an increase in frequency gives peaks which are higher and sharper and shifted to higher temperatures. In some instances there are indications of peaks in the attenuation at frequencies beyond our range of measurement.

The behavior of the dynamic modulus in the temperature and frequency range studied is similar to that of the velocity. These results combined with low-temperature static measurements and very low-frequency dynamic measurements at Notre Dame indicate a U-shaped modulus-temperature curve whose minimum broadens and shifts to higher temperatures with increasing frequency. The U-shaped curve can be explained by a generalization of the kinetic theory of rubber elasticity taking into account intra- (and inter) molecular forces; while the original theory gives only the ascending branch. The generalized kinetic theory is an analog of the so-called Ising model used in the theory of ferromagnetism and surface adsorption. The dependence of the U-curve on frequency may be described by the introduction of a relaxation spectrum, which varies with the polymer, but is in general broader for high-loss rubbers. R. S. Whitte, B. A. Mrowca, E. Guth, University of Notre Dame, Notre Dame, Ind.

Velocity and Attenuation of Supersonic Waves in Natural and Synthetic Rubbers.[1] The propagation of supersonic waves in some bulk rubbers was studied by Nolle and Mowry[3] at 10 mc. A similar study from 50 kc to 10 mc and from —50 to 90° C. was made for *Hevea*, GR-S, and Butyl gum and tread stocks. Peaks in attenuation *versus* temperature were observed. These peaks shift to lower temperatures with decreasing frequency. At a given frequency the peaks in Butyl occur about 40° C. higher than those in *Hevea*. The attenuation peaks for Butyl (a "high-loss" rubber) are broader and higher than for the other ("lower-loss") rubbers. For all stocks the velocity increases with frequency or decreases with temperature, leveling off at low temperatures.

These results are in qualitative agreement with data obtained by the strip method at much lower frequencies. For bulk waves, however, the real and imaginary parts of two elastic constants (bulk and shear moduli) determine sound velocity and attenuation. Comparison with low-frequency data requires independent measurement of the shear properties as a function of frequency. In the absence of such measurements only qualitative comparisons can be made. These measurements extend the frequency range studied by the strip method (of preceding abstract) over several decades and thus give a qualitative knowledge of the relaxation spectrum over a wide range. The interpretation of the preceding abstract also holds for this extended range. D. G. Ivey, B. A. Mrowca and E. Guth, Notre Dame.

Acoustic Measurements of Polymer Physical Properties. Acoustic methods for measuring the elastic and dissipative properties of high polymers in fiber and film form over four decades of frequency (3 to 30,000 cycles per second) are described. The experimental quantities resulting from the three different techniques necessary to cover this range are shown to be related and are unified by deriving in each case the parameters of an equivalent Voigt model (elastic and viscous element in parallel) which would behave in the same way as the polymer sample.

Examples of the application of these techniques to the characterization of high polymers are given. The effect of frequency and chemical and physical structure on the derived parameters are discussed, along with the question of heat losses resulting from cyclical differential deformation. In addition, the application of two of the methods to the characterizaton of the stiffness-temperature behavior of high polymers is described. J. W. Ballou and J. C. Smith, E. I. du Pont de Nemours & Co., Inc., Buffalo, N. Y.

Elastic Losses of Elastomers at Ultrasonic Frequencies.[4] The elastic losses in the frequency range of 0.5 to 6.0 mc. were determined by measuring the absorption of plane ultrasonic waves in sheets of the material of different thicknesses. To avoid the difficulties caused by standing waves, frequency modulated waves were used. The results were checked in some cases by using a pulsed ultrasonic beam. All the measurements were made with the samples immersed in water. The samples studied were natural rubber, butadiene-styrene copolymers of different concentration (85-15 to 60-40), without and with carbon black (gum stock and tread stock). In general, the absorption (per wave length) increases with increasing frequency, but the increase is less rapid at higher frequencies. The loaded samples have a higher absorption. As in the low-frequency range, the losses in the copolymers increase with increasing styrene content and with decreasing temperature (1° to —50° C.). The curve shapes can be explained by relaxation phenomena with one or two relaxation times of the order of 10^{-4} seconds. For a more quantitative interpretation measurements at higher frequencies are desirable. H. S. Sack and R. W. Aldrich, Cornell University, Ithaca, N. Y.

Rigidities of Polyisobutylene and Polyvinyl Acetate Solutions from Wave Propagation Measurements. Although concentrated solutions of linear high polymers behave as viscous liquids in steady flow, they support tranverse waves at audio frequencies. The wave propagation is characterized by the wave shear modulus, G, and the damping index, λ/χ_0. In the polyisobutylene solutions G increases only slightly with frequency, is independent of temperature at constant volume concentration (c), is proportional to c^3, and depends comparatively little on the choice of solvent. In polyvinyl acetate solutions, G increases considerably with frequency, falls off with increasing temperature, is proportional to c^3, and is markedly different in different solvents. The results are interpreted in terms of a transient network structure formed by random entanglements of the long-chain molecules. J. D. Ferry, J. N. Ashworth, W. M. Sawyer, University of Wisconsin, Madison, Wis.

Creep and Damping Properties of Polystyrene. Creep-time measurements are made on polystyrene specimens for various values of stress. The data are given for specimens subject to tension loading, torsion loading, and also pure bending. Analysis of the data indicates that the log of the creep rate is proportional to the log of the stress amplitude, and that the torsion and bending creep properties can be approximately estimated from the creep properties in tension.

The damping properties of polystyrene under alternating tension-compression loading have been determined by use of a resonant method. The results indicate that the damping capacity varies approximately as the stress to the 2.4 power. Tests made on other high polymers, including both thermoplastic and thermosetting materials, show a similar dependence of damping capacity on stress amplitude. These data are used for assessing the relative merits of plastic materials when operating at resonance. J. A. Sauer and J. Marin, Pennsylvania State College, State College, Pa.

Dynamic Mechanical Properties of Some High Polymers. The dynamic elastic modulus and mechanical dissipation factor for a series of high polymers have been determined as a function of temperature. Data were obtained by different methods: (a) electro-magnetic vibrators, (b) torsion pendulum, and (c) rotating cantilever beams. The frequency of applied stress varied from 0.04 to 100 cycles per second. Among the materials investigated were polystyrene, polyvinyl chloride, and cellulose acetate.

Most of the materials are characterized by a transition over a limited temperature range in which the modulus changes rapidly with temperature and the dissipation

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[1] This work was supported in part by the Office of Naval Research.

[2] Thompson, Mrowca, Guth, Paper presented at meeting of High Polymer Physics Division, APS., New York, N. Y., Jan., 1947
A. W. Nolle, *J. Acoust. Soc. Am.*, 19, 194 (1947).

[3] *Ibid.*, 20, 432 (1948).

[4] This research has been supported by ONR under contract N6-ori-91, Task 2. H. S. Sack and R. W. Aldrich, Cornell University, Ithaca, N. Y.

factor goes through a maximum. This transition is slightly frequency dependent.

The results of the dynamic tests are compared with other mechanical properties of the materials studied. Some discussion of the mechanisms of deformation and damping is given for high polymers. R. Buchdahl, L. E. Nielson, R. Levreault, Monsanto Chemical Co., Springfield, Mass.

Measurement of Mechanical Properties of Polymer Liquids by Ultrasonic Methods. In order to investigate the molecular processes which determine the mechanical behavior of high polymer liquids, longitudinal and shear wave ultrasonic measurements have been made for polyisobutylene liquids for a variety of temperature, chain length, and frequency conditions. To aid in these measurements two new shear wave techniques have been developed, the torsional crystal method and the balanced shear wave-reflection method. The torsional crystal method has demonstrated the presence of shear elasticity of the quasi-configurational type in the medium frequency range; whereas the balanced shear wave-reflection method has shown the presence of high shear stiffness of the crystalline type at high megacycle frequencies. These measurements have been correlated with longitudinal wave measurements which show a velocity and attenuation dispersion in the high megacycle range, and the cause of the dispersion has been shown to be due to the appearance of crystalline shear elasticity at the high frequencies. The measurements have been correlated by a mechanical and potential well model. Completely to account for all the longitudinal loss, a compressional viscosity, an appreciable fraction of the second shear viscosity, has to be postulated. W. P. Mason, W. O. Baker, H. J. McSkimin, and J. H. Heiss, Bell Telephone Laboratories, Murray Hill, N. J.

Non-Linear Viscous Elasticity and Secondary Bond Rupture. In the study of the visco-elastic behavior of wool and rubber-like materials, the spring-dashpot model is discarded in favor of models based on the rupture of secondary bonds. If these bonds are connected in series, the typical rubber-like stress-strain curve results. The exact nature of the curve depends on how these bonds break and reform. The resulting stress-strain curve cannot be explained with a spring-dashpot model, even including non-linear elements. Further study shows the presence of bonds in parallel, on which the stress concentrates owing to breakage. The presence of these bonds allows thixotropic humps and rupture to be explained. The various conditions under which these different explanations are valid and required are discussed. G. D. Halsey, Jr., Harvard University, Cambridge, Mass.

Reinforcement and Swelling of Butyl Rubber-Filler Systems. This study is an attempt to gain further insight into the reinforcement of polymeric networks by filler particles through the agency of volume swelling of Butyl rubber vulcanizates. Because of its low unsaturation, a maximum state of cure can be realized with all types of filler loadings while the network remains in a soft and elastic condition. Thus filler reinforcement is compared in networks of equal concentration of chemical cross-links.

In this study carbon blacks of varying particle diameter are compared to representative types of mineral fillers. In the case of carbon blacks, as the volume loading is increased, the volume swelling of the pure hydrocarbon polymer is reduced. With mineral fillers this effect is not so evident, and in some cases there is little or no change of volume swelling (over a non-pigmented control) as volume loading of the mineral filler increases. Comparisons between the volume swellings of a pigment network and its elastic properties indicate that there is a direct correlation between the increase in elastic modulus and the reduction in volume swelling.

A comparison between the contribution of chemical cross-links and secondary filler forces to network rigidity is discussed. An analysis of the relative contributions of carbon blacks and mineral fillers based upon the actual surface area added per volume of polymer shows the superiority of the carbon surface (regardless of particle size) over mineral pigment surfaces. Photomicroscopic evidence corroborates the data on filler surfaces. R. L. Zapp, Standard Oil Development Co., Elizabeth, N. J., and E. Guth, Notre Dame.

A Kinetic Concept of Elasticity. Prediction of the mechanical behavior of high polymeric materials under stress has received much attention of late years. Several workers have given attention to such materials as natural rubber, polyethylene, and cellulose derivatives. Such considerations led to network theories for rubber. Tobolsky, Eyring, Halsey, *et al.*, applied modern reaction rate theory to their mechanical concept of materials exhibiting time dependency. This work gave good results for cellulose derivative fibers, but seemed inapplicable in its simple form to many other important polymeric materials.

The Office of Naval Research has sponsored a program of study on the Resilience of Fibers in the Princeton laboratories of the Textile Foundation. In connection with this program, experimetal and theoretical studies were made on materials showing, in the terms of previous theories, an anomolous behavior. A new concept of flowing molecular chain deformations in the amorphous regions of fibrous materials has resulted in the formulation of a new theory of elasticity. The mathematical formulations of stress-strain-time relations based on this kinetic viewpoint coupling the chemical structure of polyamides and the energetics of their deformation have resulted in equations which not only conform to the experimental data, but also allow the prediction of the behavior of the given polymeric material under stress. The results of X-ray diffraction studies lend validity to the theory. R. S. Barker, W. O. Seifert, J. H. Dillon, Textile Research Foundation, Princeton University, Princeton, N. J.

The Dependence of the Tensile Strength of Vulcanized Rubber on the Degree of Cross-Linking.[5] Tensile strengths of natural rubber samples quantitatively cross-linked with decomethylene bis-methyl azodicarboxylate have been determined. The rapid increase in tensile strength with the degree of cross-linking ρ for small values of this quantity is consistent with the hypothesis that the tensile strength is directly related to the fraction of the structure permanently oriented by stretching. At higher degrees of cross-linking ($100\rho = 1.0$ to 1.05, depending on the molecular weight of the rubber) the tensile strength passes through a maximum and then declines steadily to quite low values for higher ρ's. This adverse effect of higher degrees of cross-linking is believed to result from the diminished elongation at which crystallization sets in and, hence, the smaller fraction of the network elements sufficiently oriented to participate in crystallite formation.

Modification of up to 7% of the isoprene units of the rubber with the monofunctional compound, ethyl azodicarboxylate, depresses the tensile strength of the disazo vulcanized rubber relatively little. Evidently the limited extent to which these modified chains may enter into crystallization is adequate to bring about high tensile strength. Deviations from the mean for 262 tests are well represented by a Gaussian error function. P. J. Flory, N. Rabjohn, M. C. Shaffer, Goodyear Research Laboratory, Akron, O.

Equation of State for Polystyrene. Practical considerations emphasize the desirability of formulating an adequate equation of state for polystyrene. A fairly satisfactory one is this simplified version of van der Waal's equation,

$$(P + \pi)\ (V - \omega) = nRT$$

where π is the internal pressure (or cohesive energy density) and ω is the volume at absolute zero, by extrapolation. Evaluating constants from thermal expansion data[6] and expressing P in p.s.i., V in ccs. per gram, and T in degrees Kelvin, this becomes,

$$(P + 27{,}000)\ (V - 0.822) = 11.6T.$$

Agreement with compressibility measurements, which are described in some detail, is good. Discrepancies with room temperature values of sound velocity and cohesive energy density by swelling measurements[7] are discussed briefly. R. S. Spencer and G. D. Gilmore, Dow Chemical Co., Midland, Mich.

Dynamics of Polymer Solutions and the Deformation of Separate Macromolecules. Mechanical properties in shear of dilute (0—1 9m./100cc.) solutions of polyisobutylene, polystyrene, natural rubber, and polybutadiene microgel have been investigated at 20, 40, and 80 kc. and at 7.5, 25, and 60° C. These frequencies, provided by torsionally vibrating piezo-electric crystals, correspond to times near the "macro constellation changing time" with which Kuhn proposed to characterize hypothetical shape changes in individual chain molecules. These shape changes cause entropy changes which ultimately lead to high elasticity. Accordingly, definite rigidity, as well as dynamic viscosity, should be observed even in most dilute solutions; indications of such rigidity previously have been at such low frequencies that chain interaction has seemed responsible. However significant $\mu -$ values analyzed to increase linearly with polymer concentration have now been found for the systems listed. For instance polyisobutylene of $\overline{M}_n = 1.18 \times 10^6$ has μ about 800 dynes/cm.^{2} at 20 kc., about 1200 dynes/cm.^{2} at 40 kc., and about 1500 dynes/cm.^{2} at 80 kc. in a 1% solution at 25° C. Severalfold variations in average molecular weight affect μ very little; it is also temperature insensitive, often increasing slightly at higher temperatures (as contrasted to exponential decrease for μ of pure polyisobutylene.) μ is sensitive to structure; compared to internally hindered polyisobutylene, polystyrene in benzene (with $\overline{M}_w = 234{,}000$) at 40 kc. has 700 dynes/cm.^{2}. Polybutadiene microgel ($\overline{M}_w = 18.6 \times 10^6$) with its own tiny network has μ about 1800 dynes/cm.^{2} at 40 kc., again in a 1% solution of cyclohexane, at 25° C. W. O. Baker, W. P. Mason, J. H. Heiss.

Relationship between Structure, Mechanical Properties, and Birefringence in Polymeric Materials. A thermodynamic analysis of the stretching properties of

[5] The work presented in this paper was carried out at the Goodyear research laboratory under contract to ONR.

[6] R. S. Spencer and R. F. Boyer, *J. Applied Phys.*, 17, 398 (1948).

[7] R. F. Boyer and R. S. Spencer, *J. Polymer Sci.*, 3, 97 (1948).

polyvinyl chloride and Lactoprene is made by use of reversible stress temperature data. Simultaneous birefringence measurements are used to infer configurational changes in these polymers during stretching. Configurational changes accompanying "second order transitions" are discussed in terms of the experimental data. R. S. Stein, S. Krimm, A. V. Tobolsky, Princeton University, Princeton, N. J.

The Performance of a Light Scattering Photometer for Determining High Molecular Weights. A photoelectric photometer designed for the measurement of absolute turbidity, dissymmetry, and depolarization of dilute solutions of high molecular weight materials is described. Improvements over an earlier model[8] include use of opal glass as a reference transmission diffuser, a multipler phototube receiver, and compensation of most of the refraction effects. The working relation leading to determination of absolute turbidity are developed, both for a "substitution" method and a "working standard" method. Sources of error encountered in earlier work and remedied include: serious deviations from the cosine law of emission for a reflecting diffuser of magnesium carbonate; dependence of response of phototube on plane of polarization of incident radiation; and refraction effects. Data illustrating the performance of the instrument include determination of Rayleigh's ratio and depolarization for benzene; molecular weights of sucrose octaacetate, lactoglobulin, serum albumin, and fractions of polystyrene. Agreement with other methods for these materials is in general within ±5%. B. A. Brice, Eastern Regional Research Laboratory, United States Department of Agriculture, Philadelphia 18, Pa.

Determination of Molecular Weights and Sizes by Absorption. The paper presents a convenient method for determining the weights and sizes of large molecules in solution. The method requires the measurement of secondary absorption of polymer solutions at several concentrations and several wavelengths and also a knowledge of the change of refractive index of the solutions with concentration at the wavelengths used. The conventional H^c/α *vs.* c plot for each wavelength is made, where

$$H = \frac{32\pi^3}{3}\left(\frac{\mu - \mu_0}{c}\right)^2 \frac{\mu_0^2}{N\lambda^4}$$

α is the secondary absorption (total turbidity), and c the concentration. When the molecules in solution are not small compared to the wavelength, the intercepts of the above plots will not be the same, and the equation for small molecules

$$H^c/\alpha = {}^1/_M$$

does not hold.

In such case $H^c/\alpha = ({}^1/_M)\ ({}^1/_S)$ where to a first approximation

$${}^1/_S = 1 + AD^2\,(\mu_0^2/\lambda^2),$$

where D is a molecular linear dimension. If one plots the $(H^c/\lambda)_0$ intercepts against $(\mu_0/\lambda)^2$, a straight line is obtained (for highly cross-linked polymers), and the intercept at $(\mu_0/\lambda)^2 = 0$ of this latter plot is the correct ${}^1/_M$. If one selects as a model for the molecules in solution the homogeneous sphere, Debye has shown that the slope of the $(H^c/\alpha)_0$ *vs.* $(\mu_0/\lambda)^2$ plot is just equal to $6.056D^2/M$, with D then the diameter of the homogeneous sphere. If the linear coiling model is used, the limiting slope is equal to $4.24R^2/M$, where R^2 is the square of the average distance from the beginning to end of the chain. W. M. Cashin and P. Debye, Cornell.

A Method of Measuring Molecular Weight Distribution Breadth. Based upon the suggestion of Spencer,[9] a method for estimating the breadth of the molecular weight distribution of a high polymer has been devised: a polymer solution is divided into aliquots, and part of the polymer in each aliquot is precipitated with non-solvent so that the range from complete solution to complete precipitation is covered. The weight and (weight-average) molecular weight of each precipitate is measured. From these data the distribution breadth is estimated in terms of a parameter H representing the departure of the distribution from that of a single molecular species. In the theoretical section H is related to other parameters of distribution breadth, such as Mw/Mn, for some well-known analytical distribution functions. A number of experiments with polymethyl methacrylates are described, and the results discussed with reference to polymerization kinetics. Osmotic pressure and light scattering determinations have been made to evaluate directly Mw/Mn. The values compare favorably with Mw/Mn estimated from H. Errors in both the theoretical and experimental treatments are discussed. F. W. Billmeyer, Jr., and W. H. Stockmayer, du Pont, Arlington, N. J.

Soap Solutions.[10] The light scattered by solutions of some cationic detergents has been investigated. The viscosities of these solutions have also been measured. Little difference in scattering or viscosity is observed between solutions and the solvent until the critical concentration for micelle formation is reached. For higher concentrations both quantities increase considerably over those found for the solvent. The increase in turbidity has been used to calculate the molecular weights of the soap micelles in different solvents, and under various conditions the increase in the viscosity was used to find approximate values for the density of the soap micelle. The turbidities of solutions of lauryl trimethylammonium bromide in water-glycerine mixtures were measured. They were found to decrease when the % glycerine in the solvent was increased and the micelles became smaller. When solutions of the same detergent were saturated with benzene, they were found to be more turbid than before the addition of benzene. The amount solubilized was determined spectrophotometrically. Coupling this information with the molecular weights calculated from the turbidities it can be shown that the benzene makes up about one quarter of the micelle weight. Turbidity measurements at different temperatures indicate that as the temperature is increased, the micelles become slightly smaller and the critical concentration increases. P. Debye.

Scattering by Inhomogeneous Solids.[11] The scattering of light or X-rays by an inhomogeneous solid can be interpreted in terms of the magnitude of the average square of the fluctuations in refractive index or electron density and the sizes of the regions over which they occur. The intensity and angular distribution of the light scattered by Lucite and two glass samples have been interpreted by means of a new theory which enables one to find the above quantities. The intensity of blue light (λ = 4358 Å) scattered by Lucite was found to be high and strongly dependent on angle. The scattering at an angle of six degrees from the direction of the primary beam was about 150 times more intense than at ninety degrees, indicating large sizes for the inhomogeneities. The root mean square of the fluctuations in refractive index in Lucite was about 2×10^{-4}. Scattering data found using green light could be superimposed on that for blue light in a way depending on wave length alone. Both the crown and flint glass samples studied showed only a small angular dependence of scattering for blue light, indicating that the inhomogeneities were small in size. The root mean square of the refractive index fluctuations for the crown glass was approximately the same as for Lucite. A. M. Buechen and P. Debye, Cornell.

Determination of the Shape of Particles from Dityndallism. A conclusive determination of the shape of colloidal crystals or molecules is possible by studies of the conservative dichroism or of the dityndallism. In order to occur, these effects require a partial orientation of the respective particles by streaming, in an electric or a magnetic field. A determination of the basic shape (spheres, prolate or oblate spheroids) is possible without using the distribution function. By means of the latter, the three dimensions can be determined numerically and without difficulty, if all dimensions are small compared to the wave-length of light. The method is therefore particularly promising for numerical determinations of the three dimensions of protein molecules. It can also be anticipated that the method will allow a decision as to whether or not the statistical shape of polymer molecules varies with the solvent. The Langevin-Cotton relation makes it possible to decide whether or not the shape of non-rigid particles may change during the process of orientation, thus providing a quantitative tool for the study of conservative dichroism and one for the study of dityndallism will be discussed, and a number of systematic preliminary data obtained with rigid colloidal particles will be presented. W. Heller, Wayne University, Detroit, Mich.

The Inter-Relationship of Some of the Hydrodynamic Properties of Flexible Molecules in Solution. The viscosity, diffusion, and sedimentation velocities of solutions of flexible molecules are intimately associated with the relative motion of the solvent in the vicinity of the segments of the chain. This motion is, in turn, to a large extent determined by the hydrodynamic interaction which occurs between the parts of the chain. Analogously the orienting effect of a velocity gradient depends upon the magnitude of the rotatory Brownian motion of the particle and therefore on the rotatory diffusion constant of the particle. Since this latter quantity is influenced by the resistive forces of the fluid in which it is immersed, it follows that there should be a relation between the rotatory diffusion constant and the above-mentioned properties. In particular, the rotatory diffusion constant is shown to be simply related to the intrinsic viscosity. Furthermore, data obtained from diffusion and sedimentation velocity measurements can also be used to calculate the rotatory diffusion constant. This therefore enables one to correlate viscosity, ultracentrifuge and birefringence data, since from the latter the rotatory diffusion constant can be obtained. In addition, from such birefringence data one can obtain the size of the molecule, by comparing the experimentally obtained rotatory diffusion with that theoretically obtained. J. Rise-

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[8] Speiser and Brice, *J. Optical Soc. Am.*, 34, 364 (1946). (Abstract).

[9] R. S. Spencer, *Ibid.*, 3, 606 (1948).

[10] The experimental work in connection with this paper was done by R. M. Hagen and E. W. Anacker. It was financed by the Office of Rubber Reserve, RFC, in connection with the government's synthetic rubber program and by the Procter & Gamble Co.

[11] The work reported in this paper was done in connection with the government research program on synthetic rubber under contract with the ONR.

man, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Relationship between Gough-Joule Coefficients and Moduli of Vulcanized Rubbers. The Gough-Joule coefficients (a) at constant stress and (b) at constant strain are defined and methods of measurement of each on vulcanized rubbers are given. It is shown mathematically and experimentally that the ratio of (b) to (a) is equal to the "tangent" modulus. The quotient of the Gough-Joule coefficient at constant stress divided by the stress and the quotient of the Gough-Joule coefficient at constant strain divided by the strain are shown to be constants independent of the stress-strain temperature conditions of the test. Experimental data are given for stocks based on *Hevea*, GR-S, neoprene GN, Butyl, and Butaprene. F. S. Conant, G. L. Hall, G. R. Thurman, Firestone Research Laboratory, Akron.

Polymerization in the Solid State. Some substances can apparently polymerize while in the solid state. One such material has been studied in this laboratory in some detail.

The melting point of ε—carbobenzoxy—α—carboxyl-l-lysine anhydride stored in stoppered vials at room temperature for periods up to one year has been observed to rise considerably above that of the freshly prepared sample (m.p. 101° C.). Comparison of X-ray diffraction diagrams of fresh monomer, aged monomer, and bulk polymer indicates that the aged monomer samples suffered dis orientation with distinct changes in the Bragg reflections and the diagrams of the aged specimens appear similar to diagrams given by bulk polymer.

Samples of freshly prepared monomer were heat-treated in the solid state at different temperatures below the melting point for periods up to one week. X-ray studies of these samples suggest that the threshhold temperature for the disorientation process is about 70° C. The process appears to be complete in samples heat-treated at 85° C., since their X-ray diagrams resemble those of bulk polymer, and no further change is observed at higher temperatures. E. Miller, I. Fankuchen, and H. Mark, Polytechnic Institute of Brooklyn.

Relation Between the Problems of Rubber Elasticity, Phase Change, and Ferromagnetism. R. James and E. Guth, Notre Dame.

Time and Stress Effects in the Behavior of Rubber at Low Temperature. The stiffening of rubber-like materials at low temperature involves several different phenomena, sometimes with their effects superimposed. One of these is crystallization, a rate process generally very fast at high stresses and very slow at zero stress. In these experiments at temperature near —25° C. and under a shear stress of about 148 p.s.i. the dynamic modulus of the rubber increased at a rate convenient to study. Correlation with X-ray data showed that crystallization was responsible for the increase in stiffness. The rate of change of stiffness increased rapidly with increase in applied stress, and there was no optimum temperature as has been found for unstressed rubber. The amount and kind of vulcanization influenced the stiffening: tighter cures gave smaller changes. Neoprene FR and polybutadiene, which ordinarily show little evidence of crystallization, showed very definite, but small increases in stiffness. The results with GR-S were less definite, but in some cases there were definite changes. Mixing GR-S with natural rubber seems to limit the crystallization of the natural rubber rather effectively, but apparently Neoprene FR does not mix intimately enough with natural rubber to affect the crystallization of the latter appreciably. J. R. Beatty and J. M. Davies, B. F. Goodrich Research Center, Brecksville, O.

The Compatibility, Efficiency, and Permanence of Plasticizers. This paper attempts to interrelate three important aspects of plasticizer behavior: *compatibility*, or how much plasticizer can be added without causing phase separation; *efficiency*, or how much a given amount of plasticizer lowers the brittle temperature; and *permanence*, or how well a plasticizer is retained by the polymer on heat aging or solvent treatment.

Compatibility is discussed in terms of the Flory-Huggins theory of the thermodynamics of polymer solutions, which relates the activity of the plasticizer to its concentration in the polymer. Efficiency is measured by how the plasticizer lowers the melt viscosity of the polymer. An empirical relation between efficiency and μ (the Huggins polymer-solvent interaction constant) is shown. Loss of plasticizer at elevated temperatures depends in part on the effective vapor pressure of the plasticizer and in part on how rapidly diffusion of plasticizer from the interior of the sample replenishes that lost from the surface. From the fact that diffusion constant times viscosity is a constant, it is possible to correlate measured diffusion rates with plasticizer content and with plasticizer efficiency. A linear relation is predicted and found experimentally between logarithm of the diffusion constant and the brittle temperature. In this sense the more efficient a plasticizer is, the more rapidly it can diffuse out of the polymer and be lost. Consideration is given to the effect of plasticizer on electrical resistance and tensile strength. A preliminary discussion of polymeric plasticizers is presented. R. F. Boyer, Dow.

Mechanical Properties of Polystyrene Films Cast from Solvents. Using a 2x2 block with replication design of experiment, the reproducibility of casting polystyrene films from methyl ethyl ketone and benzene was investigated. Various drying cycles were utilized to reduce the concentration of solvent so that there would no effect on the mechanical properties. Tensile strength, creep at elevated temperatures, and dynamic modulus and damping capacity measurements were used as criteria of dryness. The instrument used to measure the dynamic elastic modulus and loss factor is described in some detail.

The mechanical properties of "dry" benzene films differed from the properties of the "dry" MEK films. The change of the dynamic elastic modulus and loss factor near the so-called second-order transition point as a function of temperature and the effect of very small amounts of solvents on this transition region are discussed. E. Merz, L. Nielsen, R. Buchdahl, Monsanto.

Infrared Studies of Neoprene. Infrared absorption spectra of amorphous and crystalline neoprene in the wave length range 2-23 microns have been studied. Spectra of bromoprene and other reference compounds, the dichroism of stretched samples, and the spectral changes accompanying crystallization have been used to characterize the bands and to "assign" most of the strong bands to vibrations of more or less limited regions of the molecule.

Spectral changes, some very pronounced, accompany crystallization of the polymer either in the unstretched state or following stretching. Perceptible spectral changes were found to occur for some 12 hours following stretching of Neoprene GN, a type which tends to crystallize slowly. These spectral changes, particularly the surprising appearance of strong absorption bands when the polymer crystallizes, are of interest because of their relation to order in the polymer and also because of their bearing on general infrared applications, particularly quantitative analysis of polymer films. M. B. Hall, and W. E. Mochel, du Pont, Wilmington, Del.

X-Ray Diffraction Studies on the Stretching and Relaxation of Polyethylene. When polyethylene is stretched at 96° C., the orientation of the crystallites changes smoothly from a random configuration to a highly preferred one. This preferred orientation is "normal" and has the long-chain axes of the crystallites parallel to the stretching direction. However, when stretching is carried out at room temperature, a different preferred orientation occurs at intermediate degrees of stretch. This preferred orientation is "abnormal," and in it the long-chain axes of the crystallites are inclined at almost right angles (72 degrees) to the stretching direction. As stretching proceeds past this intermediate extension range, the preferred orientation gradually changes to the "normal" one. This same "abnormal" preferred orientation exists in the region of the "neck" in necked down polyethylene.

When highly stretched polyethylene is relaxed by heating, the disorientation of the crystallites in the "normal" preferred orientation does not occur in a gradual and random manner. Instead of the preferred orientation remaining constant and the distribution about it merely becoming broader, the preferred orientation itself changes. A. Brown, Carbide & Carbon Chemicals Corp., South Charleston, W. Va.

Macromolecular Nomenclature. A report on nomenclature in the field of macromolecules has been prepared by the National Research Council Committee on Macromolecules for submission to the corresponding commission of the International Union of Chemistry. This report will be outlined, and parts related especially to high polymer physics will be presented in detail, with the object of evoking discussion, criticism, and suggestions for revision before final adoption. M. L. Huggins, Eastman Kodak Research Laboratory, Rochester, N. Y.

Pyrolysis of Hydrocarbon Polymers. Samples (25-50 mgs.) of hydrocarbon polymers, such as polystyrene, polyisoprene, polyisobutene, polyethylene, polybutadiene, and GR-S, were pyrolyzed in a high vacuum at 350 to 450° C. in a specially designed apparatus.[12] Pyrolysis resulted in a mixture of paraffins, monoolefins, diolefins, etc., varying in molecular weight from 16 to about 1000. The mixture was separated into a gaseous, liquid, intermediate and wax-like fractions. Mass spectrometer analysis of the gaseous fraction showed it to consist in all cases of a small amount of methane. Similar analysis of the liquid fraction gave a spectrum characteristic for each polymer investigated. This spectrum can be used to identify the polymer or to determine its purity. Owing to the fact that the mass spectrometer at the present stage of development is not capable of analyzing organic compounds over 100-150 molecular weight, the intermediate and wax-like fractions were not analyzed. A molecular weight determination, by the freezing point lowering method, of the

[12] S. L. Madorsky and S. Straus, *J. Research Nat. Bur. Standards*, 40, 417 (1948). See also *Ind. Eng. Chem.*, 40, 848 (1948).
S. L. Madorsky, S. Straus, D Thompson, L. Williamson. In preparation for publication in *J. Research Nat. Bur. Standards*.

wax-like fractions gave values varying from 264 in the case of polystyrene to 775 in the case of polybutadiene. S. L. Madorsky, S. Straus, D. Thompson, L. Williamson, NBS.

Dilatometric Studies of High Polymers —I. Second Order Transition Temperature. By means of a density balance, the relationship between intrinsic viscosity and dilatometric properties is established for polyethylene terephthalate. The most pronounced property change associated with increasing intrinsic viscosity was observed to be the second-order transition temperature. The relation between crytallinity and dilatometric properties is presented for three aromatic polyesters. In every case, increased crystallinity in the polymers is associated with higher second-order transition temperatures, larger transition range, higher density and lower volume coefficients of expansion. Second-order transition temperatures, densities at 0° C., and volume coefficient of expansion are presented for a number of polyesters and vinyl polymers to illustrate the effects of chemical structure as well as physical state on these dilatometric properties. Illustration of the effect of copolymerization on second-order transition temperatures is made with a copolyester system. H. J. Kolb and E. F. Izard.

II. Crystallization of Aromatic Polyesters. By means of both a density balance and gradient tube, experimental density data are obtained to illustrate the thermal crystallization to behavior of three aromatic polyesters at temperatures from 90 to 150° C. The data are discussed with reference to both amount and rate of crystallization, and density curves are presented to show qualitative similarity between kinetics of polymer crystallization and the kinetics of chemical reactions. From the experimental data, a temperature, for convenience labeled the minimum crystallization temperature, is described and is shown to be 30 to 50° above the second-order transition temperature for the polyesters. Besides thermal crystallization, data presented show that immersion media may initiate crytallization below the minimum temperature associated with thermal crystallization of polymers. Liquids used as immersion media for polyethylene terephthalate were water, methyl alcohol, acetone, benzene, nitromethane, and nitric acid. The last four liquids initiate crystallization of the polymer at room temperature. H. J. Kolb and E. F. Izard.

Mass Spectrometric Study of Copolymer Pyrolyses. When copolymers are made from a monomer of the type CH_2CHX or CH_2CX_2 (A) and a monomer of the type CHXCHX or CH_2CXCH_2 (B), the pyrolytic yield of monomer A, $\left(\begin{matrix} Y \\ A \\ C \end{matrix}\right)$ from a copolymer of any composition made at low conversion can be estimated from the relationship

$$\frac{Y}{C}_A = \frac{Y}{C}_{A_p} \frac{A}{A+r_B B}\left[1+\frac{B}{2r_A A+r_B A+B}\ln\frac{B}{A+B}\right]$$

where $\frac{Y}{C}_{A_p}$ is the yield from the polymer of A alone, A and B are concentrations of monomers used in preparing the copolymer, r_A is the ratio of rate constants for the propagation steps of A type radicals in copolymerization, and r_B is similarly defined. The chief assumptions involved are: (1) equality of all bonds making up the chain in all sequences of A units, and (2) side reactions dependent only on the nature of A. Pyrolyses of 0.001-gram samples of styrene-butadiene and styrene-isoprene copolymers were carried out in small tubes adapted to allow complete expansion of all volatile products into the mass spectrometer. Plots of the mass 104 peak heights of monomeric styrene are in agreement with the above relation. L. A. Wall, National Bureau of Standards, Washington, D. C.

Southern Ohio Group Elects

THE Southern Ohio Rubber Group has announced the results of the recent letter balloting for officers and directors for 1949. The following were elected: chairman, James L. Fitzgerald, Premier Rubber Co.; chairman-elect, Robert B. Sucher, Inland Mfg. Division of General Motors Corp.; treasurer, Harold H. Wolfe, Dayton Rubber Co.; secretary, Russell J. Hoskins, Inland; and directors, (three years) Robert S. Radow, Dayton Rubber, Jack E. Feldman, Inland, George E. Lange, Premier; (two years) Roy H. Marston, Binney & Smith Co., Albert J. Marshall, Naugatuck Chemical Division of United States Rubber Co., Homer R. Gill, Goodyear Tire & Rubber Co.; and (one year) Herman E. Wening and Edward C. Dill, both of Inland, and Joseph Rockoff, Dayton.

ASTM Committee D-11 Symposium on Aging

A FEATURE of the spring meeting of the American Society for Testing Materials at the Edgewater Beach Hotel, Chicago, Ill., the week of February 28, will be a symposium on life aging of natural rubber and related elastomers, sponsored by Committee D-11. Simon Collier, chairman of D-11, appointed the following committee composed of members of Sub-Committee XV on Life Aging to make the necessary arrangements: G. C. Maassen, R. T. Vanderbilt Co., chairman; T. A. Bulifant, Barrett Division, Allied Chemical & Dye Corp.; H. E. Charles, Hazard Insulated Wire Co.; L. E. Cheney, Waterproof Ohio Paper Co.; L. V. Cooper, Firestone Tire & Rubber Co.; A. E. Juve, B. F. Goodrich Research Center; H. E. Outcault, St. Joseph Lead Co.; M. G. Schoch, Jr., Hewitt-Robins, Inc.; and R. D. Stiehler, National Bureau of Standards.

The symposium committee has announced that the following papers will be presented on March 2, beginning at 2:00 p.m.:

Mode of Attack of Oxygen on Rubbers, A. M. Neal and J. R. Vincent, E. I. du Pont de Nemours & Co., Inc.

Oxygen Absorption Methods and Their Utility and Limitations in the Study of Aging, J. R. Shelton, Case School of Applied Science.

Chemical Changes in Elastomers and Antioxidants during Aging, John O. Cole, Goodyear Tire & Rubber Co.

The Physical Aspects of the Aging of Rubbers, M. C. Throdahl, Monsanto Chemical Co.

Aging Effect of Ozone and Light on Rubbers, John T. Blake, Simplex Wire & Cable Co.

Effect of Temperature on the Aging of Rubbers, A. E. Juve and M. G. Schoch, Jr.

The subject of aging is one of great importance to all those who use and produce rubber and rubber products, and Committee D-11 believes that the series of papers, giving the latest authoritative information, will be of widespread interest and service. Anyone interested in the subject is invited to attend.

Meetings of the many subcommittees of D-11 will be held on March 2, 3, and 4. The D-11 luncheon will be held on March 3 and a dinner-meeting of the subcommittee chairmen with the officers of D-11 and ASTM headquarters representatives is scheduled for the evening of the same day.

Vanadiset Softeners

VANADISET rubber softeners are a series of seven asphaltic petroleum resins containing small amounts of vanadium pentoxide, manufactured by Wilson Carbon Co., Inc., 60 E. 42nd St., New York 17, N. Y. Vanadiset Grade B gives best results in rubber, according to the company's bulletin No. 10, which presents data obtained in comparative tests with the other grades. Grade B is blend of Grades D and C, the latter being the basic Vanadiset compound, and is a dry, brittle material. Grade A is a low melting point softener which retains the softening properties of Grade B, but is more suitable for hot-line tire stock compounding. Vanadiset can be blended with most asphalts to obtain working properties requiring varying softening points.

The company reports that all Vanadiset grades have proved better than asphaltic softeners used in the rubber industry and equal to one recognized non-asphaltic lubricant-softener. Properties obtained with the Vanadiset series, with best results shown by Grade B, include high tensile and elongation, good retention of physical properties upon aging, and low heat loss. In compounding, the following procedure is recommended: (1) mill rubber and accelerator for five minutes; (2) add black, then zinc oxide and mill for 12 minutes; (3) add Vanadiset softener and mill for 10 minutes; (4) add sulfur and mill for two minutes; and (5) tighten mill and pass material end over end six times in five minutes. Hard rubber materials can be made in a Banbury using Vanadiset Grades B, C, or MR, sulfur, polyvinyl chloride, and wood or clay fillers. Other applications of Vanadiset in addition to rubber compounding include use in bitumen base for battery boxes, paints, varnishes, and lacquers; printing inks; and molded products such as floor tile, wall boards, and other building materials.

Peters Addresses Quebec Group

THE Quebec Rubber & Plastics Group held a regular meeting on December 16 at the Legion Hall, Montreal, P. Q., Canada. Speaker of the evening was F. H. Peters, development department, Bank of Montreal, who talked on "Industrial Development in Canada." In the business session preceding the talk, the Group decided to hold technical meetings on rubber and plastic subjects alternately during the coming year.

Ontario Group Hears Winspear

A TALK on "Rubber Applications in the Wire and Cable Industry," by G. G. Winspear, R. T. Vanderbilt Co., Inc., featured the January 11 meeting of the Ontario Rubber Section, C.I.C., held at the University of Toronto and attended by some 40 members and guests.

Mr. Winspear covered the compounding, processing, and specific uses of natural and synthetic rubbers for wire and cable insulations and jacketings. There are 65 companies, of which seven are Canadian, who process rubber for use in wire and cable, and these companies use about 5% of the total available natural and synthetic rubber. The speaker then reviewed the types of rubber compounds used by these companies and the methods of processing and application.

Natural rubber was standard for most types of wire and cable prior to 1941, but the introduction of the various synthetic rubbers and new plastic materials has complicated the compounding picture. Neoprene and natural rubber uses are increasing rapidly owing to removal of restrictions and use in blends with GR-S to obtain better physical and processing characteristics, Mr. Winspear said. Natural rubber and GR-S are dielectric equivalents, and their relative use will vary with their price. Use of reclaim rubber in wire and cable is declining sharply.

By use of slides the speaker showed the different formulations used for wire covering and discussed curing methods, including pan or reel curing, CV curing, and lead press curing. The speaker also showed how insulation compounds are developed to obtain required physical, electrical, processing, and curing qualities and dealt with the proper selection of compounding ingredients, emphasizing the importance of the sulfur-accelerator ratio in obtaining fast cures without processing difficulty. More extensive use of carbon black is made in jacket compounds where electrial properties are not needed and mechanical strength and oil and abrasion resistance are important.

Mr. Winspear concluded his talk with a detailed discussion of wire and cable vulcanization. Pan curing of insulated wire is limited to about 250 feet a minute, but drum take-up permits extrusion rates up to 600 feet a minute. Continuous vulcanization cures range in speeds from 500 to 1,000 feet a second.

Venuto Lectures on Blacks

BLACK pigments, as related to surface coatings were the subject of a lecture delivered by L. J. Venuto, research director of Binney & Smith Co., January 7 at Wayne University, Detroit, Mich. In his talk before students of the surface coating technology course, Mr. Venuto discussed in detail the chemistry, preparation, properties, and uses of various blacks. Emphasis was placed on carbon blacks, particularly the newer furnace blacks. Iron oxide blacks, bone blacks, graphite, and other blacks were also covered with a review of the relation between basic properties and industrial uses. Handling methods for the different blacks were also reviewed by the speaker.

This lecture was one of a continuing series which Mr. Venuto has been giving before various university groups, paint and varnish production clubs, and chemical societies.

"Cold Rubber" Discussed

A TALK on the "Status of 'Cold Rubber' Development," by W. B. Reynolds, Phillips Petroleum Co., featured the January 25 meeting of the Washington Rubber Group at the Cosmos Club, Washington, D. C. Dr. Reynolds stated that a recent chemical discovery by Phillips scientists, named Diox, has greatly speeded up the "cold rubber" process. By means of Diox, "cold rubber" can be made at 14° F. in 75 minutes in contrast to the usual 12 to 16 hours. At —4° F., rubber can be made in five hours with Diox, as contrasted with 25-30 hours previously required. Diox emulsion polymerization systems are inherently perhaps 300 times as fast as the synthetic rubber system that was used during the war, Dr. Reynolds further said.

After tracing the history of "cold rubber", the speaker noted that it is now manufactured at a polymerization temperature of 41° F. in a reaction time of 16-22 hours. An improved "Custom" recipe, developed by Phillips, involves a reaction time of 13-15 hours at 41° F. The importance of the Diox development is shown by the reaction time of two to three hours that has been achieved with the "Custom" recipe in small-scale experiments.

Dr. Reynolds explained that present government-owned GR-S type of synthetic rubber plants are not designed to handle "cold rubber" production at the extremely rapid rate now permitted by Diox, but advantage can be taken of Diox to lower the cost of "cold rubber" through the use of raw ingredients which are less expensive.

The Group's next regular meeting has been postponed from February 22 to March 3, at which time Waldo L. Semon, B. F. Goodrich Co., will speak on "New Products from Research."

New Chemicals Available

THE availability of six new chemicals derived from the OXO process has been announced by Rohm & Haas Co., Philadelphia, Pa. The six new chemicals are nonanoic acid, nonylamine, nonyl aldehyde cyanohydrin, alpha-hydroxydecanoic acid, octadecenyl aldehyde, and octadecyl alcohol.

Many potential uses for these products can be foreseen. The salts of nonanoic acid with heavy metals may be useful as paint driers and as gelling agents for use in greases, coatings, etc.; while the copper salt may be of interest as a mildew-proofing agent. The vinyl and allyl esters of nonanoic acid are interesting monomers for polymerization, and other esters are possible plasticizers and lubricants.

Nonylamine is useful as an intermediate for introducing an oil-soluble amino group in the synthesis of rubber chemicals, detergents, oil additives, and other products. Octadecyl alcohol and its derivatives may be of interest as plastics molding lubricants, softeners and lubricants for textiles, antifoaming agents, plasticizers, and solvents. Nonyl aldehyde cyanohydrin and alpha-hydroxydecanoic acid may be converted to derivatives having applications as plasticizers, dye intermediates, rubber chemicals, synthetic resins, and others. The Schiff's bases prepared from octadecenyl aldehyde and aromatic primary amines may prove effective rubber accelerators and antioxidants.

Goldfinger on Reinforcement

THE January 18 meeting of the Buffalo Rubber Group, attended by approximately 27 members and guests, took place at the Hotel Westbrook. Feature of the meeting was a talk on "Some Aspects of Mechanical Reinforcement" by George Goldfinger, University of Buffalo.

Dr. Goldfinger stressed two aspects of mechanical reinforcement. The first was that a layer of rubber was adsorbed on the surface of the carbon black molecule. The second aspect was that the increase in tensile strength obtained by reinforcement could be explained by the filling in of the voids in such a way that stress would be applied to more than one chain. In cases where the chains are connected at both ends and are of different lengths, both chains could be put in tension if something were placed between them.

In addition to the talk, the meeting included a cocktail hour, dinner, and a showing of a motion picture on Saudi Arabian oil operations. The Group's schedule of meetings for the coming year was also announced, as follows: March 22, at Hotel Westbrook; May 6, joint meeting with Ontario Rubber Section, C.I.C., at Niagara Falls, Ont.; July 23, summer outing; October 11, Hotel Westbrook; December 13, Christmas Party; and January 31, 1950, probably at Hotel Westbrook, Buffalo, N. Y.

New Formulae Requested

CHEMISTS who would like to contribute formulae and recipes for useful materials for publication in Volume IX of "The Chemical Formulary" are invited to communicate with the editor-in-chief, H. Bennett, 26 Court St., Brooklyn 2, N. Y. Contributors will be listed on the board of editors and will receive a free copy of the book when published.

Expands into Plastics Field

THE expansion of William Whitman Co., Inc., 261 Fifth Ave., New York, N. Y., into the vinyl plastics field has been announced by President Albert A. List. The decision of the company was prompted by results of technological and market research in the vinyl field. A subsidiary, Whitman Plastics, Inc., is now in production at its Lynn, Mass., plant, and products will be sold through the Whitman company. Current production is devoted largely to vinyl plastic film in a wide color range, both translucent and opaque, and with distinct styling effects suitable for printing and embossing. Custom-made extruded vinyl products for industrial uses are also being produced to manufacturers' specification.

Ralph A. Nelson has been appointed sales manager of the plastics division of William Whitman Co., with headquarters at 261 Fifth Ave. It is expected that the plastic products will eventually be distributed through the company's branch offices in Boston, Mass., Chicago, Ill., Los Angeles, Calif., Philadelphia, Pa., and Charlotte, N. C.

William Whitman Co. has been in the textile business 84 years.

NEWS of the MONTH

Near-Record Tire Production and Continued Expansion of Non-Tire Lines for 1949 Predicted; Synthetic Rubber Developments

Two more rubber industry executives, W. O'Neil, of The General Tire & Rubber Co., and Harvey S. Firestone, Jr., of Firestone Tire & Rubber Co., forecast another year of near-record tire production in 1949. Bigger tires and more on and off-the-road vehicles using rubber tires during 1949 and later years were given as the reasons for these predictions. At the same time the production and the sale of non-tire products are expected to provide more than 50% of the total sales revenue of many manufacturers of rubber goods for the next several years. The status of synthetic rubber in the United States, with special reference to low-temperature GR-S, was reviewed by R. P. Dinsmore, of Goodyear Tire & Rubber Co. Dayton Rubber Co., announced that all its passenger car tires will now have treads made of low-temperature GR-S, and Lee Tire & Rubber Corp., stated that its premium line has been made with this type of rubber for some time. Seiberling Rubber Co., announced that its premium tire and tube line would be placed under fair trade restrictions and urged other tire manufacturers to follow suit. Plans for the termination of the government's patent pooling agreement are nearing completion, and plant disposal plans are expected to be recommended to the President in April or May. Stabilization of the natural rubber market by U. S. Government purchases at appropriate times, as suggested by Eric Miller, of Harrisons & Crosfield in London, met with little support in this country. Somewhat more than the usual number of wildcat strikes plagued the Akron, O., area last month.

More 1949 Predictions

In addition to the year-end statements of H. E. Smith, of United States Rubber Co., P. W. Litchfield, of Goodyear, and John L. Collyer, of The B. F. Goodrich Co., reported in our January issue, statements of W. O'Neil and Harvey S. Firestone, Jr., have become available.

Mr. O'Neil predicted that the rubber industry, keeping pace with transportation progress, will make more pounds of tires in 1949 than it made in 1948 as the trend to larger tires in passenger and truck fields becomes increasingly more pronounced. Costs of other forms of transportation have so increased that this fact, in itself, will throw a greater volume of business to the trucking industry, he added.

Weather conditions will determine whether the number of tires produced in 1949 will be greater than in 1948, but research and development activities in rubber have been tremendous, and the new year will see rubber's importance greatly enhanced not only in the automobile field, but in all industry. Synthetic rubber is responding to chemists' experiments, and the developments in "cold rubber" open great new fields.

The rubberizing of farm equipment, brought on by rising labor costs, has proved a big factor as the farmer strives to meet his task of feeding our own increasing population as well as most of Europe's. Amazing work has been done in the construction field with rubber-tired "monsters." Our nation is facing a huge program of road construction, and these big off-the-road construction giants will need bigger and stronger tires as they hustle through their jobs.

Thus, our outlook in the rubber industry for 1949 is encouraging, Mr. O'Neil concluded. From the sales standpoint, the manufacturers will experience a normal slow first-quarter, but meeting the anticipated poundage requirements should add up to another good year.

Mr. Firestone, at the annual meeting of Firestone stockholders in Akron, January 15, stated that normal competitive conditions are returning in the tire business, but 1949 demand will be much larger than that of any year before World War II.

"While it is true that production capacity of the rubber industry was substantially increased during the war and in the immediate postwar period, there are more vehicles on the road and on the farms today than ever before, and the annual mileage is increasing," he said.

"It is estimated that there may be 50,000,000 motor vehicles registered by 1955, compared with less than 30,000,000 in 1939. Consequently the average normal demand for tires will remain at a much higher level than before the war," Mr. Firestone declared.

The Firestone organization has doubled its working force and more than tripled its wage payments in its domestic plants during the past eight years, it was said, and it was pointed out that wages were again "substantially increased during 1948."

Average weekly earnings in the industry are approximately 21% higher than those of the average industrial worker in the United States, in spite of the fact that many employes work only 36 hours a week, compared with the 40-hour week typical in other manufacturing industries. Nevertheless sound planning and efficient operations have permitted the tire industry to absorb a large portion of the increased costs of materials, equipment, and labor during 1948. As in the previous year, this fact represented an outstanding exception to the generally upward trend of retail prices.

Industry Trends

Further comments on trends in the rubber industry stress the fact that during the last year it has been possible for most companies to give important attention to the producion and sale of non-tire products to the point where in some cases they obtained as much as 50% or more of their total sales revenue from non-tire lines, and an even larger percentage of their total 1948 profits. Non-tire lines now are variously estimated as numbering between 40,000 and 50,000 types of products.

According to reports during January, the footwear branch of the industry was feeling the effects of the mild weather in the eastern part of the country. Hood Rubber Co., Watertown, Mass., announced early in January that it was cutting employment about 10%, and the footwear plant of U. S. Rubber in Naugatuck, Conn., reduced the work week from 46 to 40 hours on January 22. The Bristol Mfg. Corp., Bristol, R. I., laid off 150 workers on January 14 because of small demand and high inventories.

The regular monthly report of The Rubber Manufacturers Association, Inc., issued January 18, stated that shipments of passenger casings in November totaled 4,502,700 units, a decline of 14.7% from October, when 5,275,505 casings were shipped. Production of passenger casings amounted to 4,980,269, against October production of 5,560,088, and inventories increased to 8,515,885 from 8,002,433 at the end of the previous month.

Shipments of truck and bus tires were also lower in November, with 1,089,085 units shipped, as compared with 1,216,021 in October. Production was down to 1,118,181 units from 1,190,212 in the previous month. Inventories rose on November 30 to 1,960,260 from 1,902,830 units at the end of October.

Shipments of automotive tubes in November were down to 5,123,437 units, against 6,060,516 in October; while production of tubes amounted to 5,463,453, compared with 6,323,006 in the previous month.

The value of rubber exports during November amounted to $6,833,113, the lowest figure in many months, the U. S. Department of Commerce reported on January 13. The interruption to East Coast shipping caused by the longshoremen's strike may have played a major part in the decline from the October figure of $10,820,476, it was said. For the first 11 months of 1948, exports totaled $119,101,507, a decline of 40.7% from the $200,793,147 reported for the corresponding period of 1947.

The report of the RMA for the consumption of new rubber in December estimated use at 81,196 long tons, a drop of about 9% from the November consumption of 89,066 tons. Natural rubber use was lower in December, with 46,043 long tons consumed, against 51,554 tons in November, and consumption of synthetic rubber also declined to 35,153 tons from 37,512 tons the previous month. Consumption of synthetic rubber by types for December was estimated at: GR-S, 27,177 tons; neoprene, 3,025 tons; Butyl, 4,502 tons; and nitrile types, 449 tons.

Consumption of new rubber for the year 1948 was estimated at 1,073,250 long tons, 4.4% less than 1947, but higher than the 1,039,296 tons consumed in 1946. The use of natural rubber in 1948 increased 10.8% over 1947, 623,449 tons from 562,661 the year before. Use of synthetic rubber declined in 1948 to 449,801 tons from 559,666 tons in 1947. The bulk of the reduction in use of synthetic rubber was accounted for by the drop in use of GR-S, which fell to 349,114 tons from 448,589 tons the previous year. Comparisons of other types of synthetic rubbers are as follows: neoprene, 1948, 34,317 tons, 1947, 37,703 tons; Butyl, 1948, 59,151 tons; 1947, 68,838 tons; and nitrile type rubbers, 1948, 7,219 tons; 1947, 4,536 tons.

R-1 Rubber Order Revised

Rubber Order R-1, which is administered by the Rubber Division, Office of Domestic Commerce, U. S. Department of Commerce, under E. W. Glen, was revised effective January 1, 1949. Mr. Glen, in his covering letter to rubber manufacturers, explained that the revision is a part of the general housekeeping revision of all Office of Domestic Commerce orders and regulations, but it does contain a few changes of interest to manufacturers. These changes are enumerated as follows: (1) Synthetic general housekeeping revision of all Office ments must be government synthetic rubber. (2) Military orders are now exempt from R-1 specifications. (3) Allocation of synthetic rubber by the ODC is no longer included. (4) A report of all types of synthetic rubbers whether obtained from the government or other sources, including imports, is now required. (5) A new reporting procedure has been established which requires an annual report of consumption and stocks from all persons who have consumed or owned any natural and/or major types of synthetic rubbers in the amounts specified in Section 338.75 during the calendar year and who have not been obligated to report every month on Form ODC-3410. (6) Separate reporting for military and non-military production of tires, tubes, flaps, and camelback, on Form ODC-3438, is now required. (7) A provision has been inserted which requires that natural rubber tubes made within the 20% tolerance shall be charged to and reported by the manufacturer for whose account the tubes are made and are not chargeable to a manufacturer producing the tubes for another manufacturer.

In paragraph 3 under Section 338.85 which requires that "every tube containing synthetic rubber be marked with a light blue circumferential stripe," the words "GR-I (Butyl)" should have been inserted before the words "synthetic rubber."

Seiberling "Fair Trade" Announcement

Seiberling Rubber, announced on January 16 that its premium-level passenger-car tires and puncture-sealing tubes would be placed under fair trade restrictions in all states where fair trade laws are in operation. Seiberling thus became the first tire manufacturer to attempt fair trading of tires on a national scale, according to L. M. Seiberling, vice president in charge of sales.

Pointing out that retail tire-selling has been marked in past years by "extreme down-grading of quality" brought on by sharp price cutting, Mr. Seiberling said the move was made "in answer to a crying need" by independent tire retailers, the company's principal market. He added that the net cost to consumers would not increase, because fair trading requires the manufacturer to establish the lowest "fair" retail price for his products, and to adhere to a quality standard established for the brand. This practice, he believes, will result in sale of better quality tires delivering lower cost per mile.

The company announcement said the move was experimental and could benefit dealers fully only if proper enforcement methods were developed. Mr. Seiberling said he hoped other manufacturers would adopt the policy soon.

Products coming under the new fair trade registration are the company's two top-level premium passenger-car products, the "Safe-Aire" extra low-pressure tire and the "Sealed-Air" puncture-sealing inner tube, a patented product.

It was reported that most rubber companies will probably not accept the invitation of the Seiberling Company to join in placing top-quality tires and inner tubes on a price-fixed "fair trade" basis.

A spokesman for one tire company stated that the big difficulty in attempting to "fair trade" tires is the fact that the majority of tires are sold on a trade allowance basis. A dealer could, in effect, reduce his actual price to a customer by granting a more liberal trade-in discount.

Another tire manufacturer revealed that he had considered putting his top-quality tires and tubes on a "fair trade" basis, but had not done so because of the trouble involved in enforcing the practice.

It is estimated that about 5% of the tire trade is made up of premium-grade tires. Fair trade laws exist in all states but Missouri, Texas, Vermont and the District of Columbia.

Synthetic Rubber Developments

Goodyear through Dr. Dinsmore, vice president in charge of research and development, issued an article on January 5 entitled "Synthetic Rubber Status," which it said was prepared as a result of numerous inquiries Goodyear has received in recent months on the subject of synthetic rubber in general and low-temperature or "cold-rubber" in particular.

In this article Dr. Dinsmore first pointed out that synthetic rubber continues to be of public concern because of prolonged international disturbances and the knowledge that this country cannot rely upon an uninterrupted supply of natural rubber. Military experts believe that if and when there is another war in which the United States is involved, we should not expect a conclusion in less than four or five years. In planning an emergency rubber supply this period is of primary importance.

Consumption of rubber in this country seems established at the one million tons a year level, which means that we would have to stock five million tons less whatever imports we could rely upon with certainty during a war period. A liberal estimate of 30-40% of requirements to be supplied by continuing imports in emergency still leaves the enormous stockpile demand of three to three and one-half million tons. Such a stockpile is not obtainable, Dr. Dinsmore said.

If we assume that the United States will be able to buy from 700,000 to 1,000,000 tons of natural rubber a year, this amount gives evidence of the critical need of synthetic rubber production. It is essential to national defense to maintain synthetic rubber production capacity of 600,000 tons a year, and it is also clear that no natural rubber can be stockpiled except to the extent that we replace it in our present production with an equivalent amount of synthetic.

General-purpose GR-S has been inferior to natural rubber, especially for large high-speed truck and bus tires; therefore the new low-temperature GR-S has raised speculation as to whether this development might place synthetic rubber on a basis which would be truly competitive with the natural product.

About a year ago the first government tire tests, made from pilot-plant "cold rubber," were completed. The results were greeted with enthusiasm, and many assertions were made which created the impression that the synthetic rubber problem was solved. This conclusion must be regarded as somewhat premature, Dr. Dinsmore said.

The new cold rubber gives a very marked improvement in tread-wear as against the old synthetic of perhaps 30%. This would raise it to or somewhat above the level of natural rubber. Synthetic rubber, however, has been subject to tread-cracking, and this fault develops in slow, hot-weather testing, where we have had little experience, as yet. The tendency to skid under wet, winter conditions is also yet to be determined. These two factors may enhance or off-set the tread-wear advantage over natural rubber. There can be no doubt, however, of the improvement over the old synthetic, it was said.

There is no prospect of improved value in large truck tires. The lower elasticity leaves a large gap between the new rubber and natural rubber. Some evidence exists that "cold rubber" latex products, such as foamed rubber and wire insulation, may have improved toughness. The problem of making a stable latex is still a difficult one.

The rubber is somewhat tougher to process, but gives smoother extruded products with less "swell". Overall processing costs will probably be about the same, and the cost of producing cold rubber should not be increased more than a fraction of a cent a pound.

In conclusion, it may be said that "cold rubber" is a decidedly forward step. It may bring synthetic closer to self-sufficiency. It does not yet appear to have reached that point. Nothing has yet appeared to indicate that synthetic can compete in cost with natural rubber, on a free market, with ample supply, Dr. Dinsmore concluded.

Dayton Rubber in a double-page advertisement in the January 15 issue of *The Saturday Evening Post* made a nation-wide announcement that all passenger-car tires manufactured by that company would have "cold rubber" in the wearing part of the tread. Similar announcements were scheduled for newspapers, radio, and other publications.

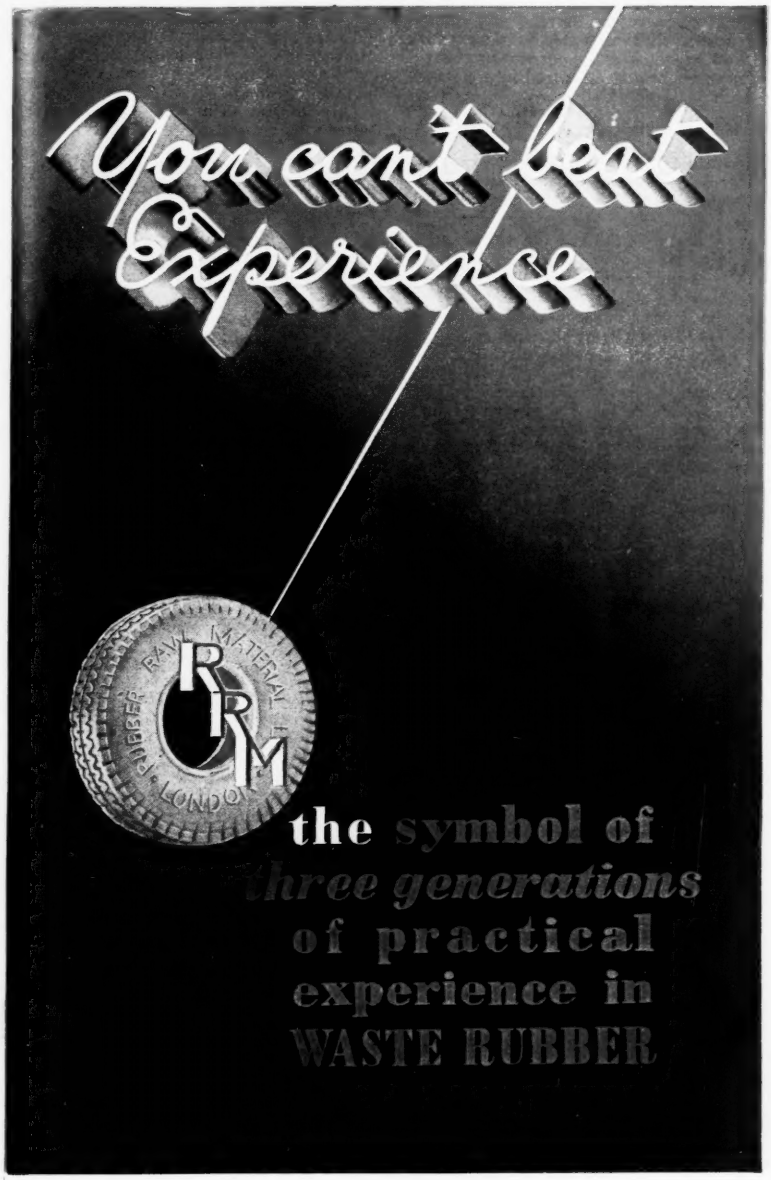
Dayton Rubber took the position that the "cold rubber" development erases any doubt as to the future of synthetic rubber and its relation to our national peace and wartime economy. The value of this new synthetic rubber in many other rubber products including belting was also emphasized.

About a week later, on January 21, it was announced that Lee Rubber had been using "cold rubber" in the manufacture of its line of super de luxe tires since July 1, 1948. The combination of the new synthetic rubber with high abrasion resistant furnace black in the manufacture of tires had increased mileage and tread wear resistance 20 to 30%, according to road tests reported by this company.

An announcement on November 25, 1948, by the B. F. Goodrich Chemical Co. that RFC had authorized increase in capacity for production of low-temperature GR-S at the Port Neches, Tex., plant to 30,000 tons a year, instead of the 15,000 tons stated in the RFC press release of November 1, means that the total capacity for "cold rubber" production has been raised from 183,0 0 to 198,000 tons.

Synthetic Patent Pool Ending

Agreement seems about to be reached for dissolution of the government sponsored patent pooling agreements on synthetic rubber which have existed since December, 1941. Mr. Collyer, revealed on January 19 that the ten companies involved have developed satisfactory terms for the return to free competition in this field and that the final action awaits agreement by the Canadian Government because of the similar pact in existence there.



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Immediate effects of the discontinuation of the patent pooling should be the stimulation of the incentive needed for discovery and production of better synthetic or chemical rubbers, it was pointed out. The information pooled up to the termination of the agreement will remain the property of the participants, but dissolution of the pool will provide former pool members with exclusive rights to any new discoveries made in the future.

Synthetic Plant Disposal Plans

According to Lockwood's *Rubber Report* for January, the Rubber and the Oil and Chemical Industry Advisory Committees on synthetic rubber of the RFC will have their reports or recommendations for plant disposal ready for submission to that agency about March 1. A combination of these findings with those of the Inter-Agency Committee will be prepared by the RFC for submission to the President some time in April or May.

It was mentioned that there is a divergence of opinion in the industry regarding the continuation of the government in the synthetic rubber producing picture, and the problem of resolving these differences with the Inter-Agency Committee recommendations is going to be difficult.

Blandford Report on Synthetic Rubber

Under the date of December 17, 1948, a report to Paul W. Shafer, chairman, Subcommittee on Organization and Mobilization, Committee on Armed Services, House of Representatives, by John R. Blandford, professional staff member, was made public, in which the results of an inspection of synthetic rubber plants in standby and in operation was described.

Thorough inspections were made of facilities at Baton Rouge and Lake Charles, La.; Port Neches, Baytown, and Houston, Tex. Besides, an inspection was made of a grain alcohol plant at Kansas City, Mo.

In general, it was stated that the plants observed, both in standby and in operation, are in very good condition. Furthermore it appears that in most cases the standby plants inspected could be reactivated and in production, assuming skilled labor and adequate feed stocks were available, in approximately 90 days.

In view of the much publicized possibilities of "cold rubber" it was deemed advisable to discuss this subject with the companies manufacturing tires and other rubber products, this report stated.

"The claims for 'cold rubber' vary as might be expected. One manufacturer claims that 'for the first time in the history of natural rubber we now have a new low-temperature rubber which is over 30% better in the largest consumption products, such as tire treads, than natural rubber.' This opinion is either shared or substantially concurred in by other manufacturers, including one of the industry's largest producers of rubber products. On the other hand, the general opinion of other manufacturers, both large and small, seems to be that of cautious optimism. Everyone seems agreed that the new low-temperature rubber is superior to the old high-temperature process rubber, but insofar as its peformance compared with natural rubber is concerned there is some feeling that an insufficient length of time has elapsed for it to have conclusively proved itself.

"However, the development of 'cold rubber' may result in increased interest on the part of private corporations in the purchase or lease of synthetic rubber facilities," Mr. Blandford stated.

The report contains tables of data regarding the butadiene, styrene, and copolymer plants, with reference to their active or standby status and information regarding the present and estimated future standby costs.

Eric Miller on Stockpiling

According to H. Eric Miller, chairman of Harrisons & Crosfield, the United States Government should make purchases of natural rubber for stockpiling from time to time to help stabilize the world price. Said Mr. Miller:

"The United States Government might usefully make stockpiling purchases whenever the rubber market shows signs of weakness. To my way of thinking American manufacturers' stocks of natural rubber are definitely on the low side, which strikes me as very short-sighted in view of the possibility of contraction of supplies coming from Indonesia.

"The International Rubber Regulation Agreement of 1934 which operated until the Japanese overran the Far East showed how fluctuations can be kept within reasonable bounds. It seems that the best interest of world trade would be served by adoption of some such measure."

Violent fluctuations in the price of natural rubber is a detriment to producers, rubber goods manufacturers, and consumers of rubber products, he added.

From Washington a spokesman for the Army-Navy Munitions Boards made the comment that the Board is "not set up to manipulate world markets." Because the Board must make its allocations in advance as part of the Congressional approval of the President's budget, before it can make any purchases, it would be difficult to conduct the price-stabilizing type of purchase suggested by Mr. Miller, it was said.

Another Washington official directly concerned with purchases of natural rubber stated, "We are stabilizing the market in the sense that we are partly responsible for a steady flow of the commodity." However "availability, not price" is the determining factor in stockpiling purchases by the United States, it was explained.

Labor Relations News

Labor disputes plagued the Akron industry area during January to a somewhat greater degree than during the past several months. The United Rubber Workers of America, CIO, has scheduled a meeting of the international policy committee in Cleveland, O., on February 21, for the purpose of deciding whether to ask for a fourth round of wage increases when most of the contracts with the rubber companies expire on June 1.

A walkout of 35 tire builders at the Mohawk Rubber Co. on January 12 brought about a shutdown of that plant and idled 500 workers for about a week. The dispute was over piece-work rates, and the president of the local URWA union termed the work stoppage "unauthorized and illegal." At a union meeting on January 17 the workers voted to return to work while the grievance was negotiated with the company.

A wildcat strike at Firestone on January 14 involved 3,500 workers. This difficulty resulted from the discharge of a millroom worker who struck a supervisor during an argument. Other millroom workers walked out in sympathy, and the plant was soon forced to cease operations because of lack of stock. Operations were resumed within about two days.

Then on January 15, 18 men who drive tractors in the Goodrich plant did not report for work because of dissatisfaction with the company's policy of rotation in connection with their work. But this difficulty was settled before the entire plant became affected.

On January 18 a wildcat strike in the battery department at the American Hard Rubber Co. plant in Akron interfered with that company's operations. This dispute, again over piece-work rates, was settled within a day or so.

About half the employes in the hose department of the Goodrich company, about 110 workers, walked off their jobs on January 22, again over the question of piece-work rates.

The U. S. Department of Labor, in a report to Congress during January, stated that on the basis of limited inspections in the rubber products manufacturing industry during the 1948 fiscal year, it was found that employers owed $48,463 to 711 of their employes because of violations of the Fair Labor Standards Act (the Federal Wage and Hour Law) and the Public Contracts Act.

W. R. McComb, Administrator of the Wage and Hour and Public Contracts, Divisions, U. S. Department of Labor, stated that failure to make proper payment for overtime work was found to be the most common type of violation; most of the back wages were allotted to employes for this reason.

"The Divisions are able to make inspections each year in only a part of the nation's more than 600,000 establishments of all types," he said. "However, on the basis of the inspections made during the 1948 fiscal year in the rubber industry, it appears that many employers still are uncertain how these basic wage and hour laws affect their employes."

He advises employers in doubt about any provisions of either law to consult the Divisions, whose regional offices are in Boston, New York, Philadelphia, Birmingham, Cleveland, Chicago, Kansas City Dallas, and San Francisco.

C. D. Garretson Honored

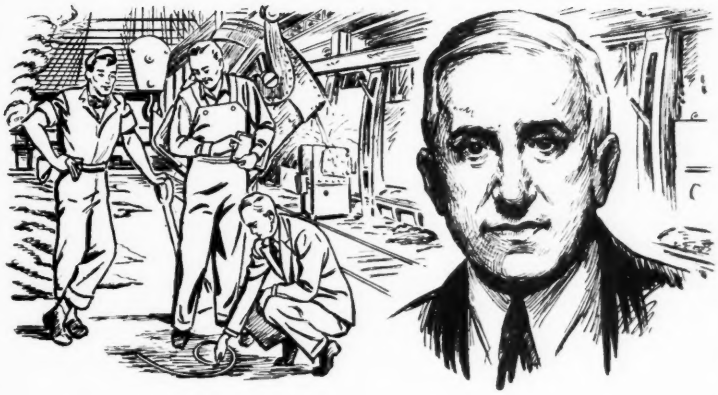
Cornelius D. Garretson, president of Electric Hose & Rubber Co., Wilmington, Del., was the guest of honor at a dinner at the Wilmington Country Club on January 20 in observance of his 50 years' activity in the rubber manufacturing industry. The dinner was arranged by the mechanical goods division of The Rubber Manufacturers Association, Inc., of which O. S. Dollison, Republic Rubber Division, Lee Rubber & Tire Corp., is chairman, and J. J. Caterall, of the Rubber Manufacturers Association, is secretary.

W. S. Richardson, president of the B. F. Goodrich Chemical Co., was master of ceremonies, and representatives of most of the rubber companies were present as members of the board of directors and the mechanical goods division of the RMA. A sterling silver cigar box was presented to Mr. Garretson by Mr. Dollison. Inscription on the box read "To C. D. Garretson, in recognition of his contributions to the progress of the mechanical rubber goods industry from his friends in the Rubber Manufacturers Association, January 20, 1949."

Mr. Garretson has been president of Electric Hose since 1923 and has been engaged in the industry for half a century with all but three years at Wilmington, Del.

TALES WORTH RETELLING

(No. 12 of a series)



CHARLES SCHWAB, during an inspection tour of one of his mills, asked the mill manager why his production was so low. "I don't know boss," the man replied. "I've tried everything I know. The men just won't produce."

It was just time for the change of shifts. Schwab, taking a piece of chalk from his pocket, turned to the nearest worker.

"How many heats did your shift make today?" he asked.

"Six," the man replied.

Without another word, Schwab bent over and wrote a big figure "6" on the cement floor.

The night shift heard the story. The next morning, the "6" was gone and a "7" was in its place. A week later, the figure was a whopping "10" and the mill was a production leader.

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Esso Research Center

A considerable number of editors of publications interested in the rubber and the plastics fields were guests of the Standard Oil Development Co. at the new Esso research center at Linden, N. J., December 8. John A. Britton, Jr., president of Enjay Co., Inc., was in charge of the party that assembled at the Esso Bldg., Rockefeller Center, New York, N. Y., and journeyed to the research center by bus, with a stop at Elizabeth, N. J., for lunch.

At the Esso research center, an overall view of which is shown in the accompanying illustration, the party first gathered in the auditorium on the main floor where Mr. Britton introduced Floyd Miller, director of the research division, and W. S. Sparks, director of the chemistry division, who made short talks.

Dr. Miller briefly explained the organization of Standard Oil Co. of New Jersey, with special reference to the position of Standard Oil Development Co. in relation to the parent company. He then gave a more detailed description of the divisions of the development company, such as, research, chemistry, technical service, development, process, etc., and mentioned that almost all of the personnel of these divisions is now at the new research center. The building was formally dedicated on October 11.

Dr. Sparks discussed the early interest of Standard Oil of N. J. in certain refinery process developed in Germany in 1929 and the agreement made with the German firms whereby the use of certain patents on synthetic rubber and low molecular weight lubricants was also obtained. It was out of the work on lubricants that Butyl rubber was developed, and it was to find a use for butadiene as a refinery by-product that the production of Perbunan was established, Dr. Sparks explained. It was also emphasized that since the government's Butyl rubber plants were designed and operated by Standard Oil of N. J., the company felt a continuing responsibility for compound development.

It was also explained that the laboratory building supplies working facilities for 600 persons. It measures about 60 by 580 feet, with three attached office wings measuring some 40 by 70 feet. Its three main floors and part of the attic are air-conditioned.

Fig. 1. The New Esso Research Center at Linden, N. J.

A tour of the research center was made with another period of time spent in one of the lecture rooms for further talks on synthetic rubber production and properties and a demonstration of the manufacture of Butyl rubber.

The 25,500-volume library on the top floor was visited together with the extensively equipped rubber and plastics testing laboratories. On the ground floor the compounding and mill room equipment was examined, and the visitors were shown the small-scale manufacture of Butyl inner tubes. Part of the equipment for this work is shown with the butt-splicer on the left, preforming apparatus in the center, and the tube curing press on the right.

Shifts at Goodrich

E. F. Tomlinson, formerly general manager of industrial products sales, has been appointed general manager of the newly created industrial and general products division of The B. F. Goodrich Co., Akron, O. This new division is a consolidation of the plastics products sales and production departments and the industrial products sales division.

Clyde O. DeLong, formerly merchandise manager of industrial products sales, has been named manager of the plastics products sales department, which will be located hereafter at the company's plastic plant near Marietta, O., where Koroseal is produced.

Going to Marietta with Mr. DeLong will be W. M. Gaston and R. W. Wisnom, handling consumer markets; R. L. Hill, R. R. Speicher, and C. J. Mischler, handling industrial markets; and N. P. Singleton, handling packaging markets.

L. H. Chenoweth will remain in Akron on special assignments for the plastics department; while E. L. Byan has been transferred to the special industrial merchandise department of the division.

Glenn E. Martin has been named manager of sales planning, to handle the creation and organization of merchandising programs for the replacement tire sales division. Mr. Martin, with Goodrich 16 years, had been manager of retail advertising in division's sales promotion department since 1941. He is succeeded in that post by Clifford E. Copp, with Goodrich 14 years.

Jay E. Miller has been appointed western public relations manager of the company, with headquarters at the Los Angeles, Calif., plant. Mr. Miller has been with Goodrich for 13 years, for the past 18 months as advertising and sales promotion manager of the associated lines sales division. Previously he had been manager of advertising and sales promotion in the industrial products division.

William Lee Davidson has been named director of the Goodrich physical research department. Dr. Davidson, a graduate of William & Mary College in Virginia, his birthplace, and Yale University where he received his doctor's degree, has been with the company since 1940. He is the co-author of a textbook on nuclear physics now in its tenth printing and widely used in major colleges and universities. The rubber company scientist went to the government atomic energy project in Oak Ridge, Tenn., in 1947 and returned to Ohio before the new Goodrich research center at Brecksville began operations in June, 1948.

Chester F. Conner has been appointed manager of the industrial products sales department of the industrial and general products division. Mr. Conner has been with Goodrich for 39 years.

James J. Newman, Goodrich vice president, was presented with the Golden Anniversary "Certificate of Public Service" of Brand Names Foundation, Inc., in recognition of the brand name "Goodrich" which has identified rubber products made by the company since 1880. The presentation, made by D. B. Douglas, vice president of Quaker Oats Co. and vice chairman of the Foundation's board of directors, was one of 26 citations to brand names in the Northern Ohio area which highlighted the Brand Names Dinner of the Foundation in Cleveland on January 12.

A new aircraft deicer capable of overcoming the severe ice conditions in the narrow air intake of a jet engine, one of the greatest problems in super-sonic flight, has been developed by Goodrich's aeronautical division and is being installed as standard equipment on a new jet bomber. Utilizing electrically heated rubber, consisting of thin, tough rubber with a core of resistance wires running through it, a special rubber lining for the jet's diffuser cowl has been fabricated through which air flows to the combustion chamber. Rigid tests in cold laboratories and in the air have demonstrated the efficiency of the equipment under severest conditions.

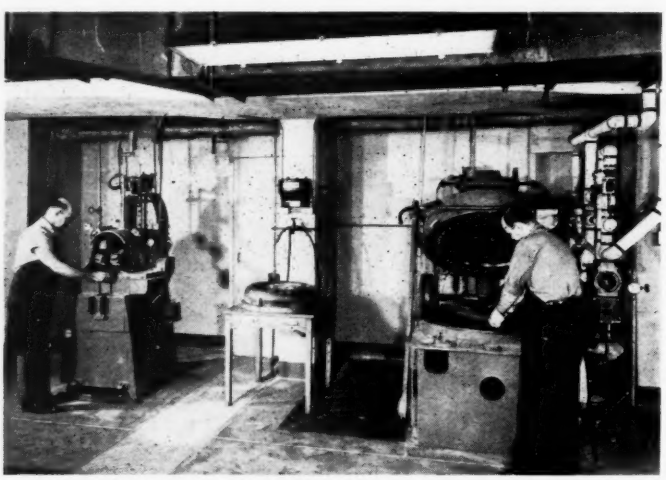

Fig. 2. The Tube Splicing and Curing Line in the Rubber Compounding Laboratory

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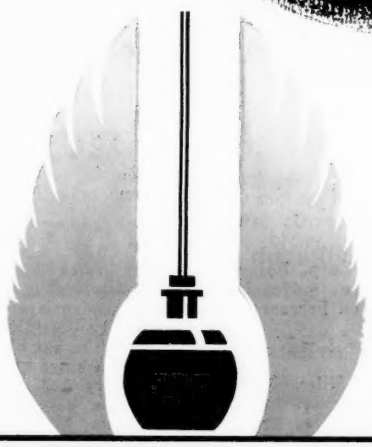

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George H. Brannan

Changes at Binney & Smith

Binney & Smith Co., 41 E. 42nd St., New York, N. Y., has named George H. Brannan to manage pigment sales in its Philadelphia, Pa., office. Mr. Brannan, who came to the company on January 1, will handle the sale of carbon blacks, iron oxide colors, bone blacks, and other Binney & Smith products in Philadelphia, Baltimore, and surrounding territory. He previously had been, for 11 years, with The Sherwin-Williams Co., first in the accounting department of the Cleveland office and later as office manager of the titanium division in Gloucester City. He was transferred early in 1942 to John Lucas Co., Inc., another subsidiary, where he served as assistant purchasing agent and then as purchasing agent.

Courtland P. Morris, resident manager of the Binney & Smith Philadelphia office since 1915, retires April 1. He had joined the company in New York in 1895.

R. A. Emmett has been advanced to assistant technical director in charge of rubber service, with headquarters in the New York office. For the past three years Mr. Emmett was technical service representative for Binney & Smith in its Akron office. After graduating from the University of Michigan, he was with The B. F. Goodrich Co., assigned to research and development compounding of synthetic rubber.

Binney & Smith Co. International has added Charles A. Polachi to its technical sales staff. Mr. Polachi, formerly with the development department of the Providence plant of the United States Rubber Co., will be primarily concerned with the foreign sales and technical service of the wide range of rubber compounding materials handled by Binney & Smith International.

The Rubber Reclaimers Association, Inc., New York, N. Y., at its annual meeting January 11 reelected the following officers: president, Carl R. Shaffer, president of Xylos Rubber Co.; vice president, H. S. Royce, Boston Woven Hose & Rubber Co.; and secretary-treasurer, Charles T. Jansen, *Rubber Age*. Jean H. Nesbit, president of U. S. Rubber Reclaiming Co., was reappointed chairman of the executive committee. Fred E. Traflet, formerly of Pequanoc Rubber Co. and active for many years in the Association, was unanimously elected an honorary member.

Shell Oil Co., Inc., 50 W. 50th St., New York 20, N. Y., has named R. T. Goodwin, manager of the aviation department since 1941, manager of the special products department in New York to succeed R. S. Mitchell, now head of the company's St. Louis marketing division. Dr. Goodwin, active in the field of organic chemistry and petroleum technology for the past 25 years, has been with Shell since 1932. As manager of the special products department, he will be responsible for the marketing of an ever-increasing number of petroleum derivatives used in industry and on the farm, including such products as liquefied petroleum gas, industrial solvents, sprays, waxes, and many other petroleum specialties.

The Third National Materials Handling Exposition, Convention Hall, Philadelphia, Pa., January 11 to 14, featured a driverless fork truck operated by ray control. Made by Automatic Transportation Co., Chicago, Ill., the driverless truck is a compact unit designed for handling loads of about ¾-ton. No explanation was given of how the ray is used to drive the truck, although it was said that radio cannot be used since radio frequencies for such a unit are unavailable. Designed by C. A. Nash and L. R. Beardsley, Illinois Institute of Technology, the truck performs all customary functions of a lightweight materials handling machine and is controlled by an operator at a panel control board.

Hood Rubber Co., division of The B. F. Goodrich Co., at Watertown, Mass., last month announced the following changes in sales personnel.

Carl W. Karshik has been made New England district manager of B. F. Goodrich footwear sales, following the retirement January 1 of W. E. Hawkins, a veteran of 34 years in sales. Mr. Karshik had represented the company for 17 years in the Cape Cod and Rhode Island territories.

D. M. Buchanan has been assigned to the Washington, D. C., area as sales representative for the Hood division, replacing N. C. Bobbitt, retired.

John J. Tardiff has been appointed manager of BFG footwear sales in Detroit.

Philip H. Cresswell will represent the BFG footwear division in the "Loop" section of downtown Chicago, succeeding Sam E. Endress, who also retired after 37 years with the company.

R. F. Larson has joined the Hood division as sales representative in the Seattle area.

United Shoe Machinery Corp., Boston, Mass., this year celebrates its golden jubilee, having been founded on February 7, 1899.

National-Standard Co., Niles, Mich., has established an industrial fellowship at Mellon Institute, Pittsburgh, Pa., to investigate in a long-range program the major problems related to the technology of the wire products, such as tire bead wire, strands for heavy-duty tire casings, music wire, and aircraft and textile wires. Also to be studied are problems related to flat strip for use in such products as piston rings, razor blades, clock and watch springs, pen points and umbrella ribs. The fellowship is headed by Charles H. T. Wilkins, formerly metallurgist with the Copperweld Steel Co.

Gordon H. Groth

Groth Advanced

The Pennsylvania Rubber Co., Jeannette, Pa., has appointed Gordon H. Groth vice president and general manager.

Howard W. Jordan has moved his headquarters to New York, where he has assumed the chairmanship of the board and has become the chief executive officer of the Metropolitan Sand & Gravel Co., a wholly owned subsidiary of the Morewood Realty Corp. Mr. Jordan, also a member of The General Tire & Rubber Co. board of directors, has been a director of both New York companies for several years.

Mr. Groth has been with Pennsylvania Rubber for five years, having served as vice president in charge of special sales. Prior to joining the company he was assistant to the vice president of sales at the Carnegie-Illinois Steel Co., and before that spent many years in the automotive parts business with the Simmons Co.

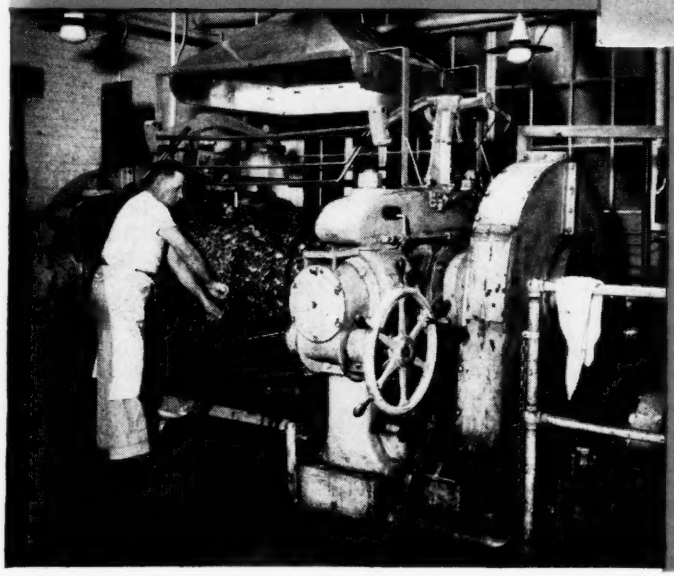
Other executives of the rubber company are R. B. Cave, vice president in charge of sales, and P. C. Mathewson, vice president in charge of production.

Robert E. Glaus has been appointed territory salesman for the Chicago branch of Pennsylvania Rubber. He formerly had been Chicago branch service manager.

C. E. Carlson, director of research of Pennsylvania Rubber, has been transferred to Akron, O., to take up new duties with the parent organization, General Tire.

The Garlock Packing Co., its origin and development, is the subject of a story in the December issue of the *Royle Forum*, published by John Royle & Sons, Paterson, N. J. The story begins with the early work on packings of Olin J. Garlock and his discovery that gaskets cut from pieces of old hose gave excellent results in a steam engine. Mr. Garlock's first commercial ventures in manufacturing packings are recounted and culminated in the establishment of The Garlock Packing Co. in 1887 as a partnership with Frederick W. Griffith and Eugene Nichols. The company prospered immediately and in 1889 built the first small factory and general offices at its present site in Palmyra, N. Y. The company's future growth and product development are described together with its activities during World War II and its future outlook.

TIMKEN® BEARINGS complete 17 years service in Vaughn mill



Unretouched photograph of 2 of the Timken bearings removed for inspection.

Good for many more!

After approximately 100,000 hours of operation on the roll necks of a 22″ x 60″ Vaughn plastics mill at a large New Jersey plant, 4 Timken tapered roller bearings were recently removed for inspection for the first time since the mill went into production, February 13, 1931.

Despite the length and severity of this service, the bearings were found to be in excellent condition and were reinstalled in the mill after readjustment to compensate for slight wear. They had been readjusted once previously in the mill.

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To help you solve your production problems, Sun Oil Company offers a wide selection of "Job Proved" petroleum products, plus the experience of Sun Engineers. Their know-how and detailed product information are yours for the asking. Call your local Sun office, or write Dept. RW-2.

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In Canada: **Sun Oil Company, Ltd., Toronto and Montreal**

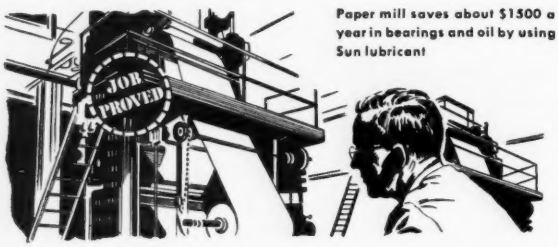
INDUSTRIAL OILS

SUNVIS 900 OILS—High-viscosity-index, paraffinic-type oils—of uniform O F pour point—fortified against rust, corrosion, oxidation, and sludge. The finest available lubricant for turbines, hydraulic systems, and similar applications.

SUNVIS HD 700 OILS—High-viscosity-index oils containing additives which minimize oxidation and give detergency. Ideal lubricants for internal combustion engines subjected to continuous heavy loads under the most adverse conditions.

SUNVIS OILS—Solvent-refined paraffinic-type oils of uniform high viscosity index, low pour point, and low carbon content. Especially suitable for application to long-time use in all types of industrial reservoirs and circulating systems.

DYNAVIS OILS—Low-pour-point, high-viscosity-index, inhibited oils, containing an additive which helps prevent formation of harmful corrosive and sludge-forming acids. Well suited for engines fitted with alloy bearings and operated at high temperatures.



Paper mill saves about $1500 a year in bearings and oil by using Sun lubricant

SOLNUS OILS—Well-refined straight mineral oils. Stand up under hard use for long periods of time. Recommended for use in machine tools, air compressors, certain types of diesels, etc.

CIRCO OILS—Used for general lubrication of industrial machinery when straight mineral oils are required.

SUNTAC OILS—100%-petroleum products which have been compounded to increase their adhesiveness. Recommended for general lubrication of all machines subjected to sudden shocks and load reversals. Cling to the parts to be lubricated.

STEAM CYLINDER OILS—High flash and fire point lubricants for either saturated or superheated steam conditions and for worm-gear speed-reduction units.

SUN CAR JOURNAL OILS—Dark oils meeting A.A.R. Specifications. For use in waste-packed bearings of railroad equipment.

SUN DELAWARE OILS—Dark oils for general lubrication on older types of industrial machinery.

SUNOCO WAY LUBRICANT—For use on tableways. Eliminates chatter and scoring . . . resists corrosion. Has good metal-wetting and adhesive properties, ample viscosity, and E. P. qualities.

SUN MARINE ENGINE OILS—Compounded with special emulsifying agents in order to provide adhesion to, and lubrication of, working parts in the presence of water. For the lubrication of bearings, eccentrics, crossheads, and various other parts of steam engines.

ROCK DRILL OIL—High-film-strength adhesive oil. For use in jackhammers, stopers, drifters, and similar equipment.

INDUSTRIAL GREASES

SUN CUP GREASES—Water resistant. For grease-cup and grease-gun application when service is normal.

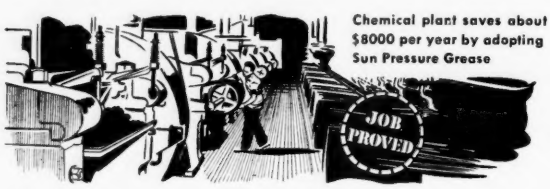
SUN GUN GREASES—Smooth greases made with medium-viscosity oil. Stable under pressure in power and booster guns.

ADHESIVE PRESSURE GREASES—Won't drip or splash. Excellent lubricants for open-gear applications.

SUN DARK PRESSURE-SYSTEM GREASES—For power-driven central grease lubricating systems in heavy industries. Also used as a "medium cup grease."

SUN MINE CAR GREASES—Available in several grades. Suitable for both antifriction bearings and plain-bearing cavity-type wheels.

SUN MINING MACHINE LUBRICANT—Semifluid. For use where a light but adhesive grease is required. Resists separation and decomposition.



Chemical plant saves about $8000 per year by adopting Sun Pressure Grease

SUN ROLLER BEARING GREASES—For use on electric motors and generators and high-temperature machinery equipped with ball or roller bearings.

SUN GEAR COMPOUNDS—Black adhesive open-gear compounds and

"JOB PROVED" IN EVERY INDUSTRY

SUN PETROLEUM

SPEED PRODUCTION, IMPROVE QUALITY

wire-cable greases. Recommended for power presses, mining machinery, worn reduction mills, crushers, pump gears, etc.

SUNOCO TRACTOR ROLLER COMPOUND—For crawler-type tractors. Provides good lubrication with exceptional sealing qualities.

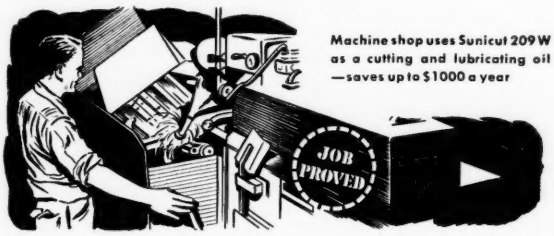
METALWORKING OILS

SUNICUT—Straight (non-emulsifiable) transparent cutting oils. Recommended for automatic screw machines and heavy-duty machining operations. Permit high speed production with excellent finishes, long tool life.

SUNOCO EMULSIFYING CUTTING OIL—A self-emulsifying oil which produces a stable white emulsion. Efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and nonferrous metals. It is also an excellent grinding coolant.

SUN QUENCHING OILS—Specially refined oils designed to aid development of maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel. Because of their low carbon content and stability under heat, these oils have an unusually long service life.



Machine shop uses Sunicut 209W as a cutting and lubricating oil—saves up to $1000 a year

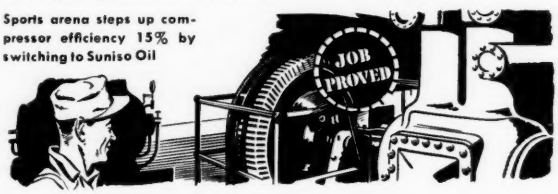
SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum, brass, and copper.

SUN ANTI-RUST COMPOUNDS—Petroleum-base oils with chemical additives designed to prevent the rusting and corrosion of steel.

REFRIGERATION OILS

SUNISO REFRIGERATION OILS—Have extremely low pour points, extremely low wax-separating characteristics, a high degree of stability and long life. Initially neutral and resistant to formation of detrimental acids under service conditions. Suniso Oils are high quality oils suitable for both high- and low-temperature operations. The most widely used oils in refrigeration and air-conditioning.

Sports arena steps up compressor efficiency 15% by switching to Suniso Oil



TEXTILE-PROCESSING OILS

SUNOTEX TEXTILE OILS—Designed to impart certain additional properties to various forms of fibers during their processing from the fiber state into a manufactured product. All Sunotex textile oils are emulsifiable in water. Highest rating in fadometer tests.

SUN COTTON CONDITIONING OILS—Pale mineral oils which condition the cotton. They prevent waste by cutting down excessive amounts of "fly" (fine air-borne lint particles).

Worsted mill obtains easier scouring, better quality, larger yield with Sunotex WO-220

SUN ASBESTOS FIBER CONDITIONING OIL—Used for spraying on the asbestos during processing. Fibers are kept from being damaged or broken down, and harmful dust is minimized when this product is used.

SUN CORDAGE OILS—Generally used alone, but are adaptable to various formulas used by cordage manufacturers. Selected products, highly compatible with additives.

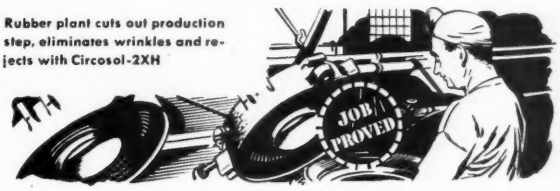
RUBBER-PROCESSING AIDS

CIRCOSOL-2XH—An elasticator and processing aid for natural rubber and especially for GR-S. Outstanding for sponge rubber.

CIRCO LIGHT PROCESS AID—A processing agent and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber. Used for GR-S to some extent.

SUNDEX-54—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established processing aid for rubber footwear stocks and semihard rubbers.

Rubber plant cuts out production step, eliminates wrinkles and rejects with Circosol-2XH



CIRCOMAR-5AA—A black-colored product for processing natural and GR-S rubber used in tire-making. Also used in reclaiming natural-rubber scrap. Replaces asphalt fluxes. Free-flowing at room temperature.

WAXES

Sun's new wax plant will be completed in 1949. Its many refining innovations and extreme flexibility will permit new types of waxes to be manufactured in large quantities—a procedure heretofore impracticable. A wide range of fully refined paraffin and microcrystalline waxes will be "tailor-made" to meet the requirements of virtually all major industrial applications. Pilot plant samples of several grades are now available.

MISCELLANEOUS INDUSTRIAL PRODUCTS

SUN SOLVENTS—Sun Spirits for the thinning of paints, varnishes, and enamels, and for metal-cleaning . . . a pure, water-white petroleum solvent free of corrosive sulphur. Other Sun solvents with special properties are available for the chemical industry.

SUN LEATHER OILS—Mineral-base leather oils. Used for obtaining the desired tensile strength, proper temper, and controlled moisture content. Maintain a light even color . . . mix well . . . distribute evenly.

"JOB PROVED" IN EVERY INDUSTRY

PRODUCTS

SUNOCO

Firestone Elections

Firestone Tire & Rubber Co., Akron, O., in its recent annual report to stockholders for the fiscal year ended October 1, 1948, revealed that the company's rubber plantations in Liberia produced 54,600,000 pounds of natural rubber during the year, much of which was shipped in the form of latex. Firestone's latex requirements more than doubled during the year, and this latex gave the company an advantageous position in the production of all types of foamed latex products.

At the annual stockholders' meeting of the Firestone company the following directors were reelected: Harvey S. Firestone, Jr., chairman, John W. Thomas, honorary chairman, Lee R. Jackson, John J. Shea, James E. Trainer, Harvey H. Hollinger, and Russell A., Leonard K., Raymond C., and Roger S. Firestone. The officers of the company: Harvey S. Firestone, Jr., chairman; Mr. Jackson, president; Mr. Shea, vice-president in charge of finance; Mr. Trainer, vice president in charge of production; Harold D. Tompkins, vice president in charge of sales; Mr. Hollinger, treasurer; Joseph Thomas, secretary and general counsel; Claude A. Pauley, comptroller; Elton H. Schulenberg and William D. Zahrt, assistant treasurers; Henry S. Brainard, assistant secretary; Timothy F. Doyle, and Laurence A. Frese, assistant comptrollers, were reelected, and in addition Raymond C. Firestone was elected vice president of the company. He will take up administrative duties in Akron in the near future; he served most recently as president and general manager of the Firestone Tire & Rubber Co. of Tennessee, Memphis.

Firestone plans a warehouse at its district headquarters at Reading Rd. and Elsinore Pl., Cincinnati, O. The one-story structure, 200 by 95 feet, will cost about $70,000.

Witco Chemical Co., 295 Madison Ave., New York 17, N. Y., last month moved its Amarillo, Tex., offices to new quarters at 1400 W. Tenth Ave., from the Fisk Building. This new central operating office functions for manufacturing plants at Sunray and Big Lake, Tex., and Eunice, N. Mex., the output of which is marketed by Witco.

Witco has also moved its Chicago office to Lincoln Tower, 75 E. Wacker Dr., Chicago 1, Ill.

Thomas F. Callahan, of the Witco company, has been elected to the executive committee of the New York Rubber Group to fill the vacancy created by the election of D. E. Jones as vice chairman.

Ideal Novelty & Toy Co., 273 Van Sinderen Ave., Brooklyn 7, N. Y., has opened an office and showroom in Merchandise Mart, Chicago, Ill., under Irving Cohen, Midwest sales manager.

Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, O., has named R. R. McClure general superintendent of the pure calcium products division plant at Painesville, O. Connected with the division for the past 19 years, Mr. McClure was made its chief chemist in 1940, production manager in 1946, and assistant division manager six months later. Prior to joining Diamond, he had served 10 years as chief chemist for the Pennsylvania Rubber Co., Jeannette, Pa.

A. Paul Thompson

Joins Eagle-Picher

The Eagle-Picher Co., 900 American Bldg., Cincinnati 1, O., has appointed A. Paul Thompson director of research to succeed the late Earle W. McMullen. Dr. Thompson formerly was with the Mellon Institute of Industrial Research where he has held a senior fellowship since 1932. Previously he had also worked for International Nickel Co. of Canada; General Chemical Co., as research engineer and consultant; and Anaconda Copper Mining Co., as chief chemist. Dr. Thompson will direct the extensive research activities of Eagle-Picher Company from its main research laboratory at Joplin, Mo. This laboratory maintains a large staff for specialized research in such subjects as paint pigments, ceramics, metallurgy, rubber, insulation, and storage batteries.

Eagle-Picher has announced that effective January 1 its lead and zinc pigments and oxides are being distributed in the Pacific Coast area by Associated Lead & Zinc Co., a corporation formed jointly by Eagle-Picher and the Northwest Lead Co. This change of policy affords more efficient distribution to all accounts in the West, particularly in the Los Angeles, San Francisco, and Seattle markets.

Sidney R. Gill, director of sales for Associated, with headquarters in Seattle, Wash., announced the appointment of Maurice O. Barr as assistant sales manager, with offices in Los Angeles, Calif. Wallace D. Miracle, with offices in San Francisco, Calif., will handle sales in that area. Associated Lead & Zinc is principally engaged in the manufacture and distribution of lead oxides and allied products, and its operations are separate and distinct from either of the parent corporations. The company has a large, new unit for manufacturing lead oxides now nearing completion at Harbor Island, Seattle, which represents a major investment in the lead and zinc industries.

The Hydraulic Press Mfg. Co., Mount Gilead, O., has appointed George A. Daniels secretary-treasurer to succeed W. C. Batchelor who resigned January 1, after 33 years' service. Mr. Daniels was controller of the company for the past two years. Prior to joining H-P-M he was associated in a financial capacity with National Tube Co. and Union Properties, Inc.

Adopts Single Trade Name

The designation of a single trade name, Lustrex, to cover all polystyrene products of the plastics division, Monsanto Chemical Co., Springfield, Mass., was reported by James R. Turnbull, general sales manager for the division. The change was made to simplify the trade name situation for manufacturers, consumers, stores, and industry in general and takes cognizance of the almost phenomenal growth of polystyrene production during the past year and future prospects for continued growth.

Monsanto's Lustrex will be classified for specific uses and formulations. Regular polystyrene products, formerly called Lustron, will be designated Lustrex L; heat resistant polystyrene, formerly Lustrex, will be known as Lustrex LX. Certain formulations noted for greatly improved moldability are further classified, as follows: Lustrex L-P1B for opaque and translucent colors; Lustrex L-P1A for transparent colors; and Lustrex L-P1X for crystal. General-purpose formulations include Lustrex LX, Lustrex L-P1L for opaques and translucents, and Lustrex L-P1 for transparents and crystals.

Koppers Co., Inc., and **Pittsburgh Plate Glass Co.,** both of Pittsburgh, Pa., on December 31 announced that Koppers Pittsburgh Co., a new Delaware corporation in which each owns 50% of the outstanding stock, has taken title to the phthalic anhydride plant at Kobuta, Pa. The product of the plant is used in paints, varnishes, lacquers, and as a plasticizer. The engineering and construction division of Koppers recently completed for Koppers Pittsburgh an addition to the Kobuta plant which will materially increase its production. The Koppers chemical division, which operated the smaller plant when it was owned exclusively by that company, will continue to operate the enlarged plant for Koppers Pittsburgh.

The principal officers of Koppers Pittsburgh are E. D. Griffin, chairman of the board; Dan M. Rugg, president; Paul R. Croll and B. J. C. van der Hoeven, vice presidents; C. R. Fay, comptroller and treasurer; and E. S. Ruffin, Jr., secretary. Messrs. Griffin, Croll, and Fay are executives of Pittsburgh Plate; while Messrs. Rugg, van der Hoeven, and Ruffin are executives of Koppers Co.

United Carbon Co., Charleston, W. Va., has added to its line of carbon blacks for domestic consumption, effective February 1, the "Atlantic" blacks of Charles Eneu Johnson & Co., Philadelphia, Pa. These Johnson channel-type blacks are Atlantic E-42, an EPC black; Atlantic 109, an MPC black; and Atlantic 98, an HPC black. In addition, blacks of the Imperial Oil & Gas Products Co., Philadelphia, are also now a part of the United Carbon line. These Imperial blacks are mostly for the printing ink trade.

Navy Purchasing Office, 111 E. 16th St., New York, N. Y., recently made awards on the following items: 10,000 women's service winter havelocks, to Rainier, Inc., Brooklyn, N. Y.; 5,000 women's bathing caps, to Seamless Rubber Co., New Haven, Conn.; 5,150 rubber shower mats, Ace Rubber, Inc., Akron, O.; 2,800 yards of rubber matting, Quaker Rubber Co., Philadelphia, Pa.; 9,300 feet of rubber matting, Melflex Products Co., Inc., Akron.

SANTICIZER 141...

simple test proves

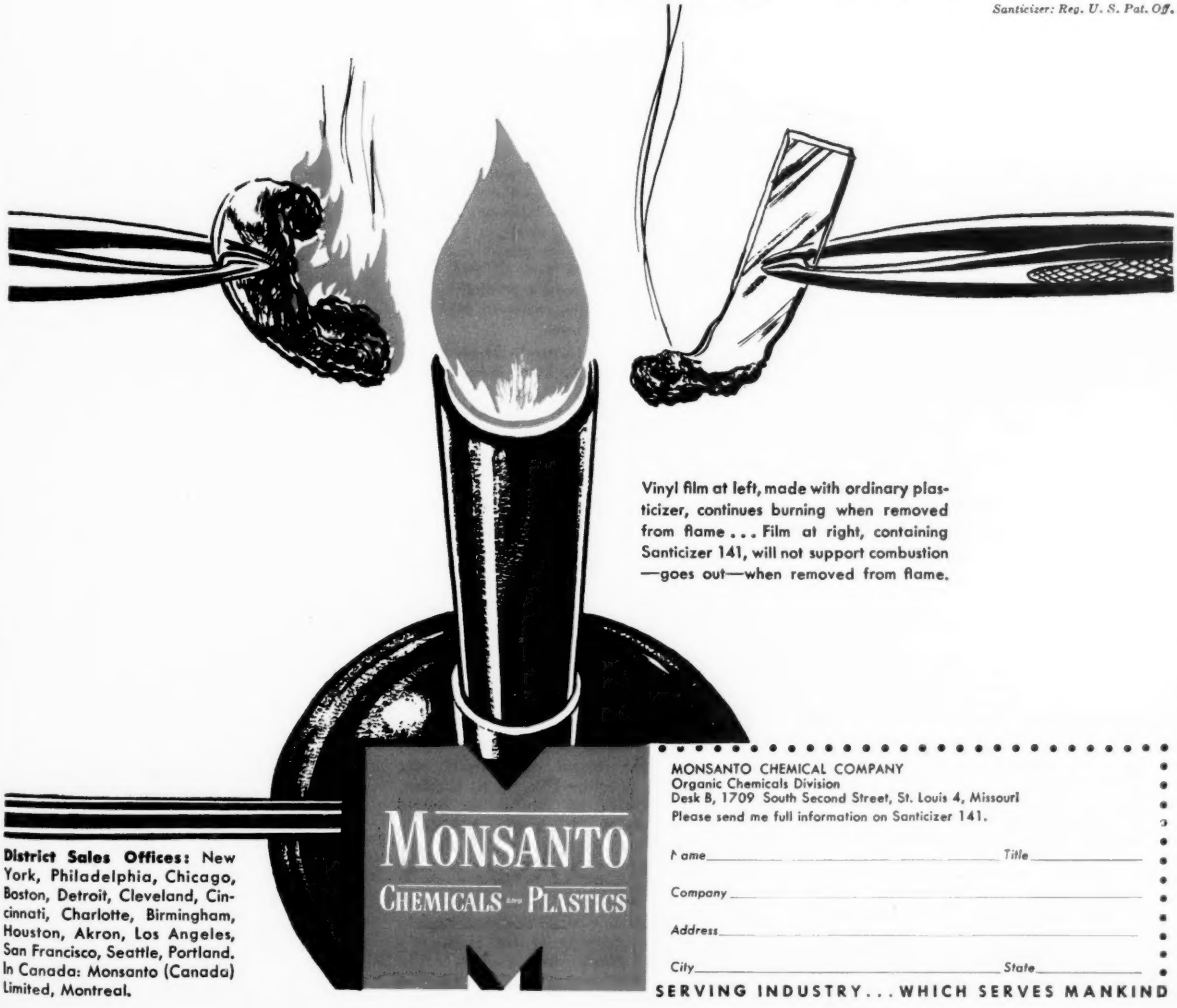
fire-retardant qualities

An easy test—made over match or burner flame—proves the outstanding fire resistance of Santicizer 141. Vinyl film made with this newest Monsanto plasticizer will burn only as long as it is in direct contact with flame . . . Flame removed, fire goes out! This action is in marked contrast with what happens to vinyl films made with ordinary plasticizers—most of them burn completely in a few seconds.

While giving excellent fire resistance, Santicizer 141 also contributes flexibility and toughness to heavy and light-gauge polyvinyl chloride films. Only this plasticizer will give so many qualities desirable in finished products . . . low toxicity, high compatibility with vinyls, low volatility, softness and drape, resistance to weathering, low temperature flexibility.

Santicizer 141 is now available in tank car, drum car or L.C.L. quantities . . . Ask any District Sales Office for full information, or write to MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, Desk B, 1709 South Second Street, St. Louis 4, Missouri.

Santicizer: Reg. U. S. Pat. Off.



Vinyl film at left, made with ordinary plasticizer, continues burning when removed from flame . . . Film at right, containing Santicizer 141, will not support combustion —goes out—when removed from flame.

MONSANTO
CHEMICALS FOR PLASTICS

District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle, Portland. In Canada: Monsanto (Canada) Limited, Montreal.

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
Desk B, 1709 South Second Street, St. Louis 4, Missouri
Please send me full information on Santicizer 141.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

SERVING INDUSTRY . . . WHICH SERVES MANKIND

B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O., has announced that the first unit of its new $3,000,000 general chemicals manufacturing plant at Avon Lake, O., is scheduled to start operations in the second quarter of this year. According to present expectations, the plant will be running at its rated capacity soon after first manufacturing operations begin. New plasticizers for vinyl and synthetic resins will be the first products made in the new plant. Trial quantities of the new plasticizers have already been made available to industry from the company's pilot-plant at Avon Lake. The new plant will produce a number of general chemicals, including beta-propiolactone, announced earlier and now available to the chemical industries in reasonable quantities. A most reactive chemical, it makes possible the manufacture of many other chemicals for which there now exists a latent demand.

The Dow Chemical Co., Midland, Mich., has completed new facilities expanding its phenol capacity by 30 million pounds a year. The new plant is now in production and, according to Director of Sales L. I. Doan, will go a long way in alleviating the phenol shortages which have been evident since the end of the war. Besides large tonnage use in the production of phenolic plastics, plywood bonding agents and other adhesives, protective coatings, and in oil refining, phenol finds application as an intermediate in the manufacture of pharmaceuticals, agricultural chemicals, and many other products.

The General Tire & Rubber Co., Akron, O., has named Thomas F. O'Neil and Dan A. Kimball to the board of directors. Mr. O'Neil, 34-year old son of General's president, Wm. F. O'Neil, is vice president and director of the Yankee Network, Inc., and a director of the Mutual Broadcasting Co. He has held an executive position in General's Boston operation since his release after serving four years in the Navy.

Mr. Kimball, a member of General's sales organization for 28 years, since 1946 has been vice president in charge of General's West Coast operations. He served 18 years as western division sales manager before being appointed in 1941 as manager of the department of government operations in Washington for General.

With the new appointments, General's board now has 11 members. One of the vacancies was created by the recent death of J. R. Kraus, Cleveland banker, and the other vacancy existed in the authorized directorship which had not been previously filled.

Seiberling Rubber Co., Akron 9, O., has made Frank Kovacs assistant to Harry P. Schrank, vice president in charge of production. Mr. Kovacs will take over some of the work in Mr. Schrank's office, permitting the vice president to move about more freely in the factory and in the field. Mr. Kovacs joined Seiberling at its founding in 1921, working as chemist, development manager, and production superintendent, but left in 1930 for the Thiokol Corp. In 1938, however, Mr. Kovacs returned to Seiberling as development manager, then went to Washington in 1945 as a member of the WPB Rubber Bureau. He left Washington in late 1945 and back with Seiberling helped work out special problems in personnel and foreman training, scheduling, and other production problems.

Promotions at U. S. Rubber

Granville T. Pownall has been elected an assistant secretary of United States Rubber Co., Rockefeller Center, New York 20, N. Y. Mr. Pownall, educated at the University of Cincinnati and Harvard Business School, joined the company in September, 1942, as assistant purchasing agent in the Scioto ordnance plant, Marion, O., operated by U. S. Rubber for the government. Later he became an administrative assistant in the secretary's office. Besides his new post, Mr. Pownall, will act as assistant to Herbert E. Smith, chairman of the board and chief executive officer. Mr. Pownall will also be assistant secretary of the executive committee and assistant secretary of the board of benefits and awards.

William M. Dougherty, assistant to the new president, Harry E. Humphreys, Jr., will relinquish his duties as assistant secretary of the company to devote all his time to the former position.

Charles Heitzmann, executive assistant to the president, retired January 1 after more than 46 years with the company. His first employment in the rubber business was with the Peerless Rubber Mfg. Co., of which he was secretary, treasurer, and director and which subsequently became part of U. S. Rubber Co. Over a period of years he has occupied executive positions covering a wide range of diverse activity in finance and sales management. Mr. Heitzmann was graduated in 1902 from the New York University School of Commerce, Finance, and Accounts. He is a member of the board of governors of the New York Athletic Club, a director of the Brooklyn Borough Gas Co., and a member of the Metropolitan Club and Delta Sigma Pi.

Fred A. Schwarz has been appointed manager of credits and collections, succeeding Fred A. Cyr, who retired after nearly 50 years of service. Mr. Schwarz started with U. S. Rubber as a clerk in Chicago in 1911. Later he became credit manager of the Chicago branch and in 1932 was transferred to the company's general offices in New York to become assistant manager of credits and collections.

M. A. MacConnel, formerly Detroit district manager for U. S. Tires division, has been transferred to New Orleans as district manager and is succeeded at Detroit by H. E. Walker, formerly district manager at New Orleans.

Herbert E. Smith, chairman of the board, U. S. Rubber, has accepted the leadership of the rubber industry's group for the Red Cross 1949 Fund and also the chairmanship of the rubber committee in the current anniversary appeal being launched by the New York Public Library.

Recent Developments Announced

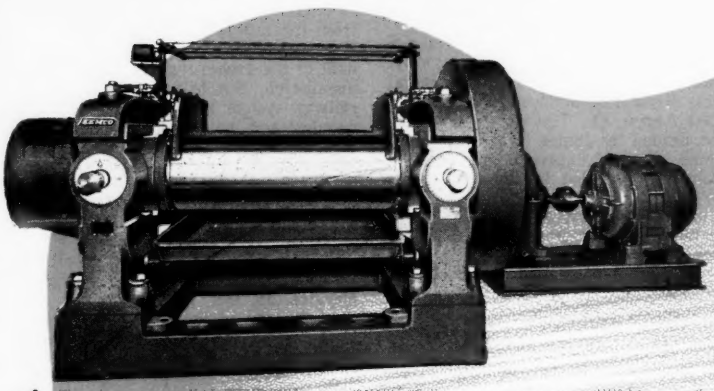
Perma Starch, a liquid "permanent starch" said to keep clothes crisp through eight to ten launderings and also to make cottons wear twice as long, has been introduced by Perma Starch, Inc. This milk-like plastic, based on Kandar, the synthetic resin developed by U. S. Rubber, also resists wilting of clothes in humid weather and retards fading and mildewing, according to Perry V. Eakin, senior partner of Perma Starch. The new product was successfully marketed on a trial basis in Chicago and Detroit and is now being introduced on a nation-wide scale as rapidly as increased production at the company's Illiopolis, Ill., plant will permit. The starch-like plastic requires no heating or cooking. One cup of the liquid is diluted with three cups of cool tap water. Clothes are dipped into the solution, wrung out thoroughly, and hung to dry. They can be ironed when only slightly damp, thus reducing ironing time. Composed of colorless plastic particles fine enough to penetrate the inner fibers of cotton threads, the material is said to leave no streaks or blotches even on black fabrics. When heated by ironing, the particles melt around the thread fibers, swell, and solidify, thus embedding and holding the fibers in place. The new material imparts the same appearance and feel as starch and provides uniform stiffness without brittleness, Mr. Eakin stated.

Uskon conductive rubber panels, developed by U. S. Rubber, are being used for the radiant heating of chinchilla pens at the Babylon, N. Y., breeding farm of Owen Reynolds, pioneer chinchilla breeder. Uskon ceiling panels have been installed to maintain an even temperature of 70° F. for the valuable animals, which require an even, natural heat without danger of fumes, drafts, cold spots, or heating failures.

A new type of vacuum cleaner which picks up dirt and dust through a rubber hose and blows it down the sink drain has been invented by Arthur N. McGuire, former vacuum cleaner salesman. Operation of the cleaner is made possible by the use of a highly flexible Multi-Flex rubber hose, produced by U. S. Rubber, which stretches to five times its original length and enables the housewife to clean a wide area without moving the machine. Constructed of pure rubber, the hose has no wire or fabric reinforcement, will not collapse under suction, is highly resistant to abrasion, and will regain its shape after being stepped on, it is claimed. The new cleaner, said to be more efficient than existing types, is being produced by Hydroway, Inc., Philadelphia, Pa.

A new, heavy-duty conveyer belt, claimed to be the longest coal-slope conveyer in the world, has been put into operation in Storrs Colliery, near Scranton, Pa. Designed and built at U. S. Rubber's Passaic, N. J., plant, the rubber and fabric belt is more than a mile in length and will carry 300 tons of coal an hour. Employing a special belting fabric known as Ustex-Nylon, which combines high-strength cotton and nylon fibers, the belt is said to be 250-400% stronger than other belts of rubber and fabric construction. The new belt is 36 inches wide, is powered by a 400 h.p. drive, and hauls coal continuously to the surface from a point 2,640 feet underground. Coal company engineers estimate that this new conveyer belt results in a saving of 6,000 feet of haulage and approximately 50¢ a ton of coal mined.

U. S. Rubber has expanded manufacturing facilities for U. S. Rug Underlay to make possible national distribution of this new sponge material for carpets and large rugs. The underlay was first introduced about a year ago and proved so popular that demand exceeded production despite the doubling of manufacturing facilities. Claimed advantages include luxurious feel, permanent resilience and cleanliness, increase in life of the rug or carpet, ability to be cleaned readily, non-slip feature, and thermal insulation. In addition the underlay will not pack down or bunch, pull apart or fray, and is non-staining. The sponge material is sold in 54-inch widths which can be joined with adhesive tape and cut to any shape or dimension for laying.



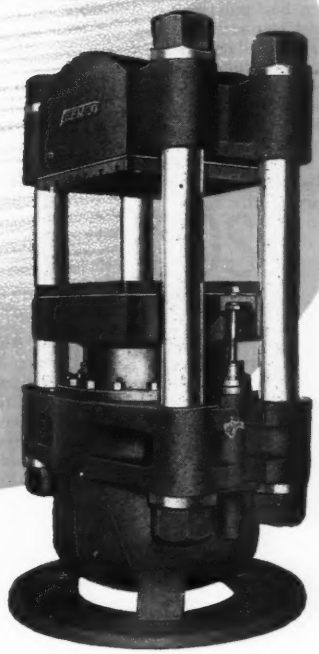
Heavy-duty Mills, in all sizes up to 84 inches, featuring extra heavy construction, smooth operation, and long life.

Laboratory Mills furnished with built-in motor, control and adjustable speed drive. Entirely enclosed ready to operate. Mechanism is readily accessible.

QUICK PROFITS with EEMCO'S QUICKER DELIVERY

42—ton Laboratory Presses, entirely self-contained, equipped with 12"x12" platens, occupying floor space of only 14"x26". Has adjustable opening.

Presses for compression, transfer molding, laminating, and polishing. All sizes and types. Custom built.



TO INCREASE PRODUCTION — and therefore profits — you should choose EEMCO. Here is a line made in a factory with more than 30 years experience in Rubber and Plastic machinery. EEMCO operates its own modern foundry and machine shop, and has every facility including a large stock of motors, controls, and necessary component parts to insure quick delivery. Choose EEMCO for correct design and sturdy dependability. Built for heavy duty and long life, EEMCO saves time and money. Currently, EEMCO is making exceptionally fast deliveries. Write today for quotations.

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EEMCO — ERIE ENGINE & MFG. CO.

953 EAST 12th ST., ERIE, PENNA.

RUBBER AND PLASTICS MACHINERY DIVISION

An oil-resistant, high-pressure steam hose for pile drivers used in heavy construction work has been developed by U. S. Rubber. The hose is especially designed to withstand the deteriorating effects of a combination of steam and hot oil resulting from the lubrication of pile driving tools through steam pressure lines. Marketed under the trade name of Matchless Pile Driver Hose, the new product is constructed of a rubber core compounded for oil resistance, two or three plies of braided steel wire, depending on the diameter of the hose, one ply of asbestos cord, and a heat-resistant rubber cover. The braided wire construction provides unusually high bursting strength and acts as an armor to withstand heavy external abuse.

U. S. Rubber's cycle tire department is sponsoring a series of comic books called "Bike Comics" which will be distributed free by dealers to juvenile readers. The first of the series is expected to be ready for distribution about March 1 and will be a 16-page affair. Planned as a sales stimulant for bicycles and accessories, the company is absorbing the bulk of the cost of producing the books, with jobbers and dealers buying the book in quantity at a nominal price.

The mechanical goods division of U. S. Rubber has published a 100-page manual to assist engineers in designing both multiple and light-duty V-belt drives. The manual contains comprehensive data on drives, sheaves, dimensions, weights, layouts, and similar pertinent information. Detailed information on the company's U. S. Royal super-service V-belts, U. S. Rainbow steel cord belts, and standard U. S. Rainbow V-belts with equa-tensil cord section is also included.

The Premier Rubber Co., Dayton, O., is completing a new three-story brick and concrete warehouse at a cost of $150,000. A private track from the Baltimore & Ohio Railroad is being constructed direct to the building. The firm also recently installed a 400-h.p. Babcock & Wilcox boiler. Premier's building program likewise includes an addition to its offices. Manufacturing facilities have also been increased by installation of a new 84-inch Adamson mill.

Universal Seven-Seas Corp., 37 Wall St., New York 5, N. Y., offers a buying and selling service for businessmen and companies. The firm is engaged in the export and import of general merchandise, including rubber, cotton, metals, grain, rice and other foodstuffs, chemicals, pharmaceuticals, sugar, paper, silk, tea, lumber, and Oriental products. Edward E. Pratt, former chief of the Bureau of Foreign and Domestic Commerce and former acting secretary of the United States Department of Commerce, is chairman of the board, and Harper Wang, general manager of Universal Import & Export Co., Shanghai, China, is President of the firm.

National Association of Manufacturers, New York, N. Y., recently elected as a director-at-large for 1949 and 1950, E. J. Thomas, president, Goodyear Tire & Rubber Co., Akron, O. Harvey S. Firestone, Jr., chairman of the board, Firestone Tire & Rubber Co., Akron, and H. W. Prentis, Jr., Armstrong Cork Co., Lancaster, Pa., are among those continuing as members of the NAM board of directors.

Creates New Department

Creation of a vinyl film and fabrics department to handle sales of a new vinyl film has been announced by the general products division of Goodyear Tire & Rubber Co., Akron, O. The new department will be headed by James S. Bruskin, who has some 12 years' experience in the plastics fabric field, aided by E. J. Dunlavy and W. E. Channing, both previously with the division's Pliofilm department.

The new vinyl material is the result of a long research program and has been produced experimentally for almost a year before being placed on the market. This film is said to be sunfast, flame and tear resistant, non-shrinking, stain and spot resistant, and easily cleaned. The film will be produced in a wide range of modern pastel colors, including both translucent and solid types, and in a variety of handsome patterns for use in garment bags, matched closet accessories, drapes, curtains, table covers, aprons, and other products.

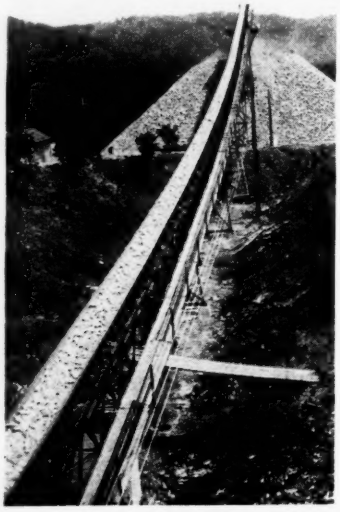
T. W. Prior, of the sales and office personnel department, has been appointed manager of squadrons and Goodyear Industrial University. Mr. Prior, who will be responsible to L. D. Hochberg, director of training, replaces E. H. Hamlin, transferred to the companys' production organization. Although Mr. Prior's previous responsibility for recruiting college trainees will remain in the sales and office personnel department, he will act as adviser and will assist in this work.

Returning to Akron from New York, N. Y., where he held the position of assistant to Goodyear's northeast division sales manager, Howard C. Corsaut has been put in charge of wholesale sales training, succeeding J. C. Wright, Jr., who transfers to the Seattle district as manufacturers sales representative. Mr. Corsaut will also be responsible to Mr. Hochberg.

After 32 years with Goodyear, mostly covering the five continents outside of the United States, Clinton E. Croke, assistant to the general manager of Goodyear Foreign Operations since 1945, is retiring and will make his home in the West.

Goodyear's Recent Developments

A four-flight conveyer belt, designed by Goodyear engineers, is moving a limestone mountain at the rate of 350 tons an hour from the quarry of the Blue Ridge Stone Corp., near Roanoke, Va., on a ¾-mile haul to the processing plant. A permanent installation, the belt conveyer replaces a railway system previously used and gives speedier and more efficient operation, it is said. The first three flights of the belt haul stone to the stockpile; while the fourth delivers from the stockpile to the plant. The first belt tunnels under the quarry floor to receive the stone, then lifts 57 feet to the secondary crusher. Here the load transfer to the second belt which travels 1,300 feet, spans a work road, and elevates 55 feet to the quarry rim to discharge on to the next belt. This third belt negotiates a highway underpass, then swings upward on a 1,025-foot radius to unload on a 70-foot high stockpile. The last belt tunnels under the stockpile, then runs 1,600 feet to the finishing plant. The primary belt is 42 inches wide; while the three others are 30 inches wide.

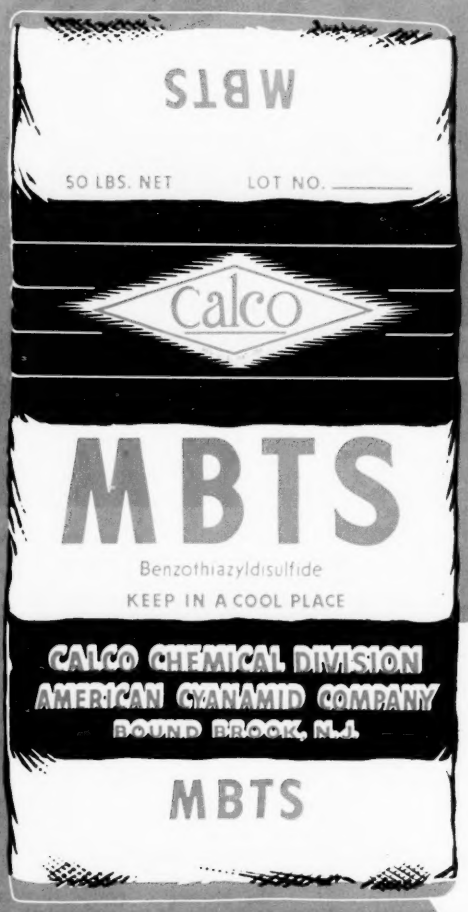


Goodyear Conveyer Belt Unloading at Stockpile at Blue Ridge Stone Plant

Faced with a tremendous salvage and temporary flotation problem at the Bikini atom bomb test, the Navy asked Goodyear to design a lightweight salvage pontoon that could be handled easily and quickly. Using experience gained in rubberized fabrics manufacture, Goodyear engineers designed and built three sizes of syringe-bulb shaped rubber-coated fabric air containers capable of lifting 15, 25 and 40 tons, respectively. One of the biggest problems to overcome was the changing pressures that would be encountered during the rapid rise of the pontoons to the surface from the ocean depths. To overcome this pressure problem, company engineers adopted a pumpkin design for the pontoons. To facilitate handling the pontoons are constructed in 25-ton units that can be rigged in tandem to give added lifting force. The pontoons are constructed of nylon fabric coated with synthetic rubber. Cables encased in heavy rubber hose are attached to a fitting at the top of the pontoon and spread out around the conical body. The cables give a fluted appearance to the pontoon, and the hose prevents the cables from damaging the fabric.

An interesting walking test, comparing the relative merits of two types of shoe soles, was conducted in Washington, D. C., last summer under the sponsorship of Goodyear. Six students were employed to walk an average of 300 miles each over a period of 23 days. Each walker had one shoe soled with leather and the other soled with Neolite. Examinations conducted during and after the tests revealed no harmful effects as the result of wearing either leather or Neolite soles. Statistics on the test also indicated that a Neolite sole would give approximately 100% more mileage than the average leather sole. It was also determined that a person's height and weight have no standard effect on shoe life.

An innovation in bicycle tires, a tire designed for use in snow, mud, and other heavy going, has been announced by Goodyear. Designated the Studded tire, the new product has heavy blocks or "studs" deeply etched in both its tread and shoulder so as to furnish maximum traction and non-skidding. The tire is intended primarily for motor bikes and other types of bicycles needed for year-around operation and makes more practical their use on snow and slush-covered highways, on country roads, or in any rough going requiring additional traction and safety. The Studded tire is equivalent to Goodyear's Double Eagle premium bicycle tire in quality and will be made in both the 24x2.125 and 26x2.125 sizes, in black sidewalls only.



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AMERICAN Cyanamid COMPANY

CALCO CHEMICAL DIVISION
RUBBER CHEMICALS DEPARTMENT
BOUND BROOK, NEW JERSEY

Calco

SALES REPRESENTATIVES AND WAREHOUSE STOCKS: Akron Chemical Company, Akron, Ohio • Ernest Jacoby & Company, Boston, Mass. • Herron & Meyer of Chicago, Chicago, Ill. • H. M. Royal, Inc., Los Angeles, Calif. • H. M. Royal, Inc., Trenton, N. J. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto.

WEST

Walter Boswell

New Richardson Agent

Frank Andrews, sales manager for the Sid Richardson Carbon Co., Fort Worth 2, Tex., recently announced the appointment of Thiokol Corp., Trenton, N. J., as its West Coast representative for the sale of Texas E and M channel blacks. Walter Boswell is in charge of Thiokol's sales office in that area, and he will continue to operate from his present office at 1709 W. Eighth St., Los Angeles, Calif.

Mr. Boswell is well known on the West Coast, having been directly connected with the rubber industry since his association with The C. P. Hall Co. of Los Angeles in the early Forties. In 1942 he established the West Coast Office for Thiokol Corp. Mr. Boswell also is a member of both the Northern California and the Los Angeles Rubber groups and is past secretary of the latter organization.

Sid Richardson Carbon Co. has made Harry Brubaker assistant manager of its division office at Akron. After graduation from Akron University, Mr. Brubaker was employed by The B. F. Goodrich Co., then he was transferred to the Hycar Chemical Co., shortly after its organization in 1940, where he remained until his entrance into the United States Army in 1942. After his return in 1945, Mr. Brubaker became associated with Phillips Petroleum Co. in its rubber chemicals division at Akron. On September 20, 1948, he resigned.

Swift & Co., Chicago 9, Ill., has begun operations and made initial shipments from the new industrial oil processing unit at the Swift technical products plant at Hammond, Ind. This new plant, located on part of a 70-acre tract set aside for further development of facilities, includes units to perform solvent crystallization, solvent fractionation, and fat splitting in integral operation. Products will provide raw materials for industries manufacturing rubber products, cosmetics, soaps, waxes and polishes, linoleum, paint, textiles, printing inks, buffing and lubricating compounds, and others. Research into new and improved products is to be carried on in an experimental pilot-plant at Hammond and in Swift's central research laboratories.

Harry Brubaker

Union Pacific Railroad Co., Omaha, Neb., has released a new sound-color 16 mm. film on highway grade-crossing accidents. Climactic highlight of the film, entitled "Look, Listen and Live," is a train wreck caused by a careless motorist. To make the scene realistic, the company used a derrick to lay an entire train on its side along the railroad right-of-way during the filming of the "accident." The company also issued simultaneously a new 12-page booklet, with the same title as the film, which features the grade-crossing demise of a cartoon character named Dizzy Dan. Both the film and the booklet are the latest efforts of Union Pacific to counteract the mounting toll of grade-crossing accidents. The film, which took six months to make and cost almost $50,000, was produced after conferences between the railroad's superintendent of safety and the governors of the 11 western states served by Union Pacific. Distribution of the film and the booklet will be made through the highway patrols of these 11 states.

Raybestos-Manhattan, Inc., has opened a new warehouse and office at 314 Occidental Ave., Seattle, Wash., which will carry a complete stock of industrial rubber products. This new branch, in charge of Russell G. Heuman, is part of the West Coast sales division, whose headquarters are at 131 Mission St., San Francisco, Calif., where Littleton C. Barkley is general sales manager of the division.

Minnesota Mining & Mfg. Co., St. Paul, Minn., has created a new central manufacturing division, with Byron J. Oakes general manager of the unit. This division will begin by coordinating the operations of the National Synthetic Rubber Corp., a 3M subsidiary in Louisville, Ky., and those of the special products division in St. Paul. Other units will be added to central manufacturing's supervision when they do not fit into existing divisions. Mr. Oakes joined the 3M organization as a chemist in 1928 and for the past five years has been general manager of NSRC.

Richard H. Bennett has been advanced to director of purchases of Brunswick-Balke-Collender Co., Chicago, Ill. He formerly had been staff assistant to the manufacturing manager at the company's Muskegon, Mich., factory.

The C. P. Hall Co., Akron, O., has appointed John H. McSparran manager of its San Francisco, Calif., office. Mr. McSparran, after several years in athletics and teaching, then in the Navy during the war, was with the market division of Shell Chemical Corp. in San Francisco before joining Hall.

John H. McSparran

Changes at Monsanto

Monsanto Chemical Co., St. Louis, Mo., has appointed Howard S. Bergen assistant coordinator of the plasticizers, resins, and solvents group of the organic division development department. Mr. Bergen, with the company since February, 1946, will be primarily concerned with the administration of the development program on plasticizers, assisting J. Kenneth Craver, coordinator of the group.

Arthur P. Kroeger, since August, 1945, assistant general manager of sales for the Monsanto organic chemicals division, has returned to active duty after an absence of nearly a year because of poor health. He came to Monsanto in 1929.

Several changes in organization were also announced by Robinson Ord, general manager of sales for the division.

Charles H. Sommer, Jr., acting assistant during Mr. Kroeger's illness, has been appointed assistant general manager of sales and will be responsible for field supervision and coordination; while Mr. Kroeger will be in charge of home office administration. Mr. Sommer has been with the company 14 years and had been manager of plasticizers and intermediates sales since 1945.

Other changes were the promotions of Seth U. Shorey to manager of plasticizers and resins sales and of B. B. Langton to manager of intermediates sales. Both men had headed up their respective departments during the interim. Mr. Shorey joined Monsanto in 1936, and Mr. Langton in 1940.

To aid Mr. Shorey, A. D. Evans has been transferred from the company's Detroit sales office. J. G. Hicks, formerly in St. Louis, replaces Mr. Evans in Detroit.

Francis J. Curtis, vice president and secretary of the executive committee at Monsanto, has been elected president of the American Institute of Chemical Engineers.

Now A POLYMERIC PLASTICIZER AT A MONOMERIC PRICE—

PARAPLEX G-50

PARAPLEX G-50 now costs 39½c a pound* in quantity—actually less than most monomerics!

When PARAPLEX G-50 joined G-25 and G-40 as a polymeric plasticizer for vinyl compounds, it combined for the first time these great advantages: the permanent plasticizing effect and non-migratory characteristics that only a high-molecular-weight modifier can show, *plus* the simplicity of processing and ease of handling that once were exclusive properties of the monomeric plasticizers.

Now there's another important advantage — the new low cost of PARAPLEX G-50— that brings the qualities of this resinous plasticizer to the whole range of vinyl processing methods and vinyl applications: to extruding, calendering, molding, dispersion compounding, and to coated fabrics, electrical insulation, and both light and heavy weight film.

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If you have thought of PARAPLEX G-50 as a necessity in your high-cost, highest-quality vinyl production only . . .

If you have evaluated the permanence of PARAPLEX G-50, or its unequalled pigment-grinding ability, or its adaptability to dispersion compounding . . .

Or if you have only glanced wistfully at this plasticizer's freedom from odor or taste, or at its resistance to extraction, its processing ease, its non-migratibility . . .

Contact us immediately. Our technical staff will be glad to answer any questions you may wish to ask about your use of PARAPLEX G-50 — the polymeric plasticizer at a monomeric price.

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CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square Philadelphia 5, Pa.

The Resinous Products Division was formerly The Resinous Products & Chemical Company

United Welding & Mfg. Co., division of Harris Enterprises, Inc., Los Angeles, Calif., has designed and built a pressure vessel said to be one of the world's largest curing chambers. The vessel measures 43 feet in depth and 12.5 feet in diameter and has been shipped to Firestone Tire & Rubber Co. of California for use in the manufacture of large self-sealing rubber fuel cells. The vessel is of A.S.M.E. approved electric welded construction and is built to withstand 100 p.s.i. working pressure or full vacuum. The vessel features the company's Harris quick-opening safety door which, despite its diameter of 12.5 feet, opens or closes, sealing or unsealing completely, in approximately 35 seconds.

CANADA

Rubber Industry Forecast

Reviews of the Canadian rubber industry include forecasts by Greig B. Smith, manager of the Rubber Association of Canada, and by *The Financial Post* of Montreal that some decrease in production will take place during 1949, but that sales in the domestic market will remain at reasonably high levels. The decrease in production is viewed as the result of the process of building up normal inventories during 1948, coupled with dwindling export markets as a result of exchange difficulties.

After a slump in the early months of 1948, Mr. Smith said, tire sales picked up and remained at high levels throughout the balance of the year, with the result that total 1948 tire sales in units were only slightly less than for the record year of 1947. The main factors behind this high sales level were: (1) an active demand for original equipment tires which shows no signs of slackening; (2) a demand for replacement tires well above prewar levels, which is expected to remain at a high level; and (3) an increasing demand for farm service tires.

A further decline in the rubber footwear industry is looked for, according to the *Post*, particularly in the export market which normally accounts for about one-third of sales. For the most part the sale of industrial rubber products is seen as depending directly on the general level of industrial activity in Canada, which appears likely to remain high during 1949.

R. C. Berkinshaw, vice president and general manager of Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., predicts reduced rubber exports, but a strong domestic demand for 1948. The domestic demand for rubber goods and services will continue strong, probably during the greater part of the year, although an increasing buyer resistance will be evident, Mr. Berkinshaw said.

"We will experience a reduction in overall export shipments, mainly due to monetary restrictions and exchange control. This factor will have the effect of building up a surplus in many commodities with a corresponding depressing effect on market prices, except where offset by some stockpiling for emergency or defense purposes."

Mr. Berkinshaw also pointed out that any forecast for 1949 must be qualified by consideration of changes in the international situation during the year.

Management, Labor Meet

More than 300 employers and labor delegates, representing 15 major industries in the Province of Quebec, gathered in Montreal on December 28 in the first good-will meeting between union labor and management. Hopes for continued prosperity and cooperation in 1949 were voiced by C. C. Thackray, president of Dominion Rubber Co. of Canada, Ltd., who praised the part that each employe in a modern plant is playing to advance industry. High productivity and cooperation between management and labor are important factors for the mutual success of both groups in any industrial undertaking, Mr. Thackray stated that a healthy employment situation required a reasonable profit for employers since such profits mean a successful company and good jobs. He reviewed the great progress made possible by labor and management cooperation during the past few years and said that wise leadership on both sides accept their respective responsibilities.

"When either unions or management stoop to unfair practices in labor relations, it becomes necessary for government agencies to step in and regulate and control such actions," Mr. Thackray said.

Narcisse A. Gauvin after 37 years' continuous service retired January 1 from Gutta Percha & Rubber, Ltd., Toronto 3, Ont., Canada. Mr. Gauvin began his career with the Rubber Tire Wheel Co. in 1908 and went to Gutta Percha in 1912. He is a member of the Canadian Commercial Travellers Association and the Montreal District Chamber of Commerce.

J. C. Alexander has been appointed general sales manager, mechanical goods division, of Dominion Rubber Co., Ltd., Montreal, P. Q. Formerly assistant general sales manager, mechanical goods division, Mr. Alexander succeeds Georges Bergeron, who has been retired under the company's pension plan.

OBITUARY

Charles E. Wickers

ONE of the founders and vice president of The Laurel Co., Garfield, N. J., Charles Edward Wickers, is dead as the result of a heart attack suffered on January 9. Funeral services were held January 12 at St. John's Episcopal Church, Passaic, N. J., followed by burial at Greenwood Cemetery, Brooklyn, N. Y.

Mr. Wickers was born January 7, 1866, in New York, N. Y., and there attended grammar and high schools and the College of the City of New York. He was associated with Fowler Bros., New York, for 25 years before entering into the rubber industry in 1905. In 1906 he helped found The Laurel Co., with which he was associated until his death.

The deceased was active in the affairs of St. John's Episcopal Church.

He is survived by his wife, a son, Arthur T. Wickers, president of The Laurel Co., and two brothers.

Frank C. Jones

THE president and general manager of the Okonite Co., Passaic, N. J., Frank Cazenove Jones, died in a New York, N. Y., hospital January 20 after a three-month illness.

He was born in New York 61 years ago. He attended the Nobel & Greenough School and Harvard University, from which he was graduated in 1910. He began his business career with B. T. Babbitt, Inc., and later was treasurer of Edgar A. Wilhelmi, Inc. In 1914 he organized Jones & Cammack, an importing concern, where he remained until he left for Army service in 1917. Upon the death of his father, F. C. Jones, co-founder of Okonite Co., the younger Mr. Jones joined the company as a director and in 1919 was named treasurer and general manager. In 1932 he became president and general manager. He was also president of the Okonite-Callender Cable Co., Inc., Paterson, N. J.

Mr. Jones was a member of the board of governors and a past president of the National Electrical Manufacturers Association, a member of the board of the National Association of Manufacturers, a member of the Department of Commerce Business Advisory Committee, of the board of governors of the Passaic Hospital Association, of the executive committee of the Montclair chapter of the American Red Cross, a director of the Passaic National Bank & Trust Co. and the New York Lubricating Oil Co., and president of the Community Chest of Montclair and of Montclair Horse Show, Inc., During the war he had been on the WPB Copper Industry Advisory Committee.

The deceased also belonged to the Racquet & Tennis, Union, Harvard, Engineers, Montclair Golf, Montclair Athletic, Pennington, Chicago, and Pine Orchard Clubs, the Downtown Athletic Club of New York, the Aztec Club of 1847 of Washington, and the Electric Club of Chicago.

Funeral services were at St. Luke's Episcopal Church, Montclair, N. J. on January 24 followed by private interment.

Surviving the deceased are his wife, his daughter, and his two sisters.

John J. Voorhees

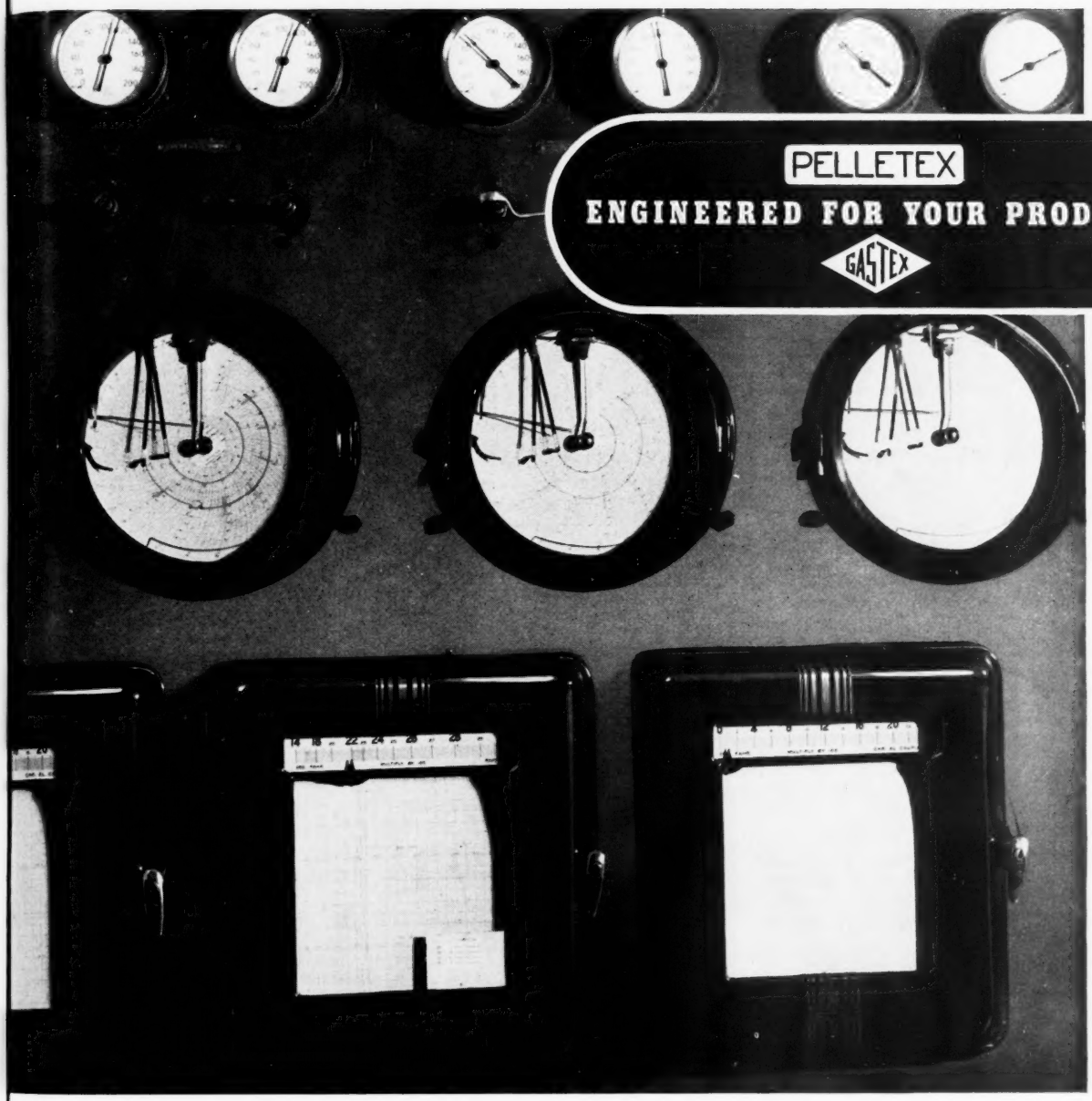
JOHN J. VOORHEES, president of Voorhees Rubber Mfg. Co., Inc., New York, N. Y., from 1922 to 1927, died December 23 at his Jersey City, N. J., home from coronary thrombosis. He was born April 9, 1876, in Jersey City.

Mr. Voorhees became associated with the Voorhees company in 1898, the same year that he was graduated from Lafayette College with a degree in civil engineering. During his long career in the rubber industry he took an active part in the development of many new products and processes, among them puncture-proof tires, the Sensation line of transmission belting and hose, and typewriter platens.

A former president of Whittier House, Mr. Voorhees was also a member of Phi Kappa Psi, the Masons, the Chamber of Commerce, the Rotary Club, a board member of Christ Hospital, senior warden and treasurer of St. Paul's Episcopal Church, and a member of the executive board of the Jersey City Community Chest.

Funeral services were held December 27 at St. Paul's Church, Jersey City, followed by burial at Bay View Cemetery, Jersey City.

Surviving the deceased are the widow, a daughter, and two brothers.



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The B. E. Dougherty Company, Los Angeles and San Francisco • Harrisons & Crosfield (Canada), Ltd., Toronto and Montreal

NEWS ABOUT PEOPLE

Thomas R. Weichel, formerly with the United States Bureau of Mines, is now mining electrical engineer of the sales department of the Hazard Insulated Wire Works Division of The Okonite Co., Wilkes-Barre, Pa. Mr. Weichel will work closely with the technical and production departments, as well as sales, in developing cable designs to aid in the electrification of mines.

William R. Cisney has resigned as assistant general sales manager of A. Schrader's Son, Division of Scovill Mfg. Co., Inc., Brooklyn, N. Y. Mr. Cisney represented Schrader since leaving college in 1922.

James W. Pollard, Jr., has been named assistant superintendent of the Glidden Co.'s lithopone division in Baltimore, Md., it was announced last month by J. P. Ruth, vice president of the Glidden Co., Cleveland, O., in charge of the chemical and pigment division. In his new capacity Mr. Pollard will assist I. J. Foote, superintendent of the lithopone division.

Lynn R. Strawn, for 16 years with The Texas Co. at Port Arthur, has been appointed manager of the Neches plant of Jefferson Chemical Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y. Prior to accepting the new position with Jefferson, Mr. Strawn was in charge of process engineering activities in all phases of light oil and lubricating oil manufacture and gas processing at the Port Arthur plant. The appointment of Mr. Strawn results from the transfer of A. A. Triska, previous plant manager, to New York, where he will assume new duties with Jefferson as assistant to the manager of the production department.

John J. Mahoney has been appointed director of engineering of Foster D. Snell, Inc., consulting firm of chemists and engineers, 29 W. 15th St., New York 11, N. Y. Mr. Mahoney, a graduate of the College of the City of New York, formerly had been with Colgate-Palmolive-Peet Co., Burns & Roe, Selas Corp. of America, and the Philadelphia Navy Yard.

J. Edwin Conaway, 56, southern district manager of New York Belting & Packing Co., Passaic, N. J., died December 14 as the result of injuries sustained in an automobile accident near Cisco, Tex. Emil C. Schnake, southern sales representative for the company, who was driving the car at the time the accident occurred, was seriously hurt, but is expected to recover. He is being treated in the Harris Hospital, Fort Worth, Tex.

Matthew S. Fox, partner, Charles Slaughter & Co., 66 Beaver St., New York 4, N. Y., was elected a vice president — for the rubber trade group — of Commodity Exchange, Inc., New York, at the meeting of the board of governors, January 20, when Edward L. McKendrew and Floyd Y. Keeler were reelected president and treasurer, respectively. Among the new members elected to the board was Jacobus F. Frank, shippers agent, 120 Wall St.

Joseph A. Neubauer

Joseph A. Neubauer has been appointed technical director for the Columbia Chemical Division of Pittsburgh Plate Glass Co., Pittsburgh, Pa., and for Southern Alkali Corp., Corpus Christi, Tex. Mr. Neubauer had served as technical adviser to Columbia Chemical since 1945. Associated with Pittsburgh Plate since 1933, he first worked in the soda ash and chlorine departments and later as assistant to the production manager at the firm's Barberton, O., plant. Mr. Neubauer was the first superintendent of Columbia's large chlorine and caustic soda producing plant at Natrium, W. Va., which went into production during 1943. His present headquarters are in Pittsburgh.

Osgood V. Tracy is now manager of the chemical products department of Esso Standard Oil Co., 15 W. 51st St., New York 19, N. Y. He had been assistant manager of the department. Closely associated with the development of synthetic rubbers, alcohols, and other chemical products from petroleum since he joined the company in 1930, Mr. Tracy had previously served as division head of the Standard Oil Development Co., central technical organization of Standard Oil Co. (New Jersey) affiliates, and as manufacturing coordinator of chemical products for Esso Standard. He will continue as a director of Enjay Co., Inc., chemical products marketing affiliate of Esso.

Ralph M. Darrin has been elected a commercial vice president by the board of directors of General Electric Co., Schenectady, N. Y., and has been transferred to customer relations work in the New England territory, with headquarters in Boston, Mass. He formerly had been manager of the apparatus department's central station divisions at Schenectady. He came to G-E in 1919.

Wm. J. Pritchard has joined the staff of V. L. Smithers Laboratories, 2706 First Central Tower, Akron 8, O. He had been with The Pharis Tire & Rubber Co., Newark, O., for more than 19 years. While there his duties were in the development laboratories and in factory control.

Leo B. Grant has been named manager of the New York, N. Y., sales office of The Dow Chemical Co., Midland, Mich., to succeed the late Ralph E. Dorland. Mr. Grant was associated with Dow's magnesium division in Midland two decades before joining the executive staff of the New York office a year ago.

F. J. French has joined the technical staff of Kirkhill Rubber Co., Los Angeles, Calif., after 19½ years with Gates Rubber Co., Denver, Colo., where he was manager of the molded goods development department.

Roy M. Vance is now chief chemist at the Ohio Rubber Co., Willoughby, O. Mr. Vance, the immediate past chairman of the Akron Rubber Group, had previously been with The General Tire & Rubber Co. and the Miller Division of The B. F. Goodrich Co.

Bernard H. McGuiness, for three years works manager of the Passaic, N. J., plant of Hewitt-Robins Inc., has been appointed vice president of the company's Robins Conveyors Division. Mr. McGuiness, who joined the company in 1923, was for many years general superintendent of installations of the division.

Harry A. Julian recently resigned as assistant sales manager of the Seiberling Rubber Co., Akron, O., to join Better Ball Co., Palmyra, Pa.

Harry L. Arbogast is now factory manager and technical superintendent of West American Rubber Co., Los Angeles, Calif. His previous connections include Phoenix Mfg. Co., Joliet, Ill., and Firestone Industrial Products Co., Noblesville, Ind.

R. L. deBrauwere has been elected assistant vice president of the Scovill Mfg. Co., Waterbury, Conn., but continues as assistant secretary of Scovill and as secretary and director of A. Schrader's Son, Inc., Brooklyn, N. Y. Mr. deBrauwere has been with Schrader since 1915. He started in the purchasing department and later became traffic manager, advertising manager, branch manager of the Akron office, and general sales manager from 1925 to 1940. In 1934 he was elected assistant secretary of Scovill besides his duties with Schrader.

Arnim Brandt, general manager of Schacht Rubber Mfg. Co., Huntington, Ind., on January 17 entertained the local Lion's Club with a history of the company, which began about 40 years ago in a small frame building.

Karl Arnstein, vice president of engineering, Goodyear Aircraft Corp., recently was elected a vice president, aircraft, of the Society of Automotive Engineers, 29 W. 39th St., New York 18, N. Y.

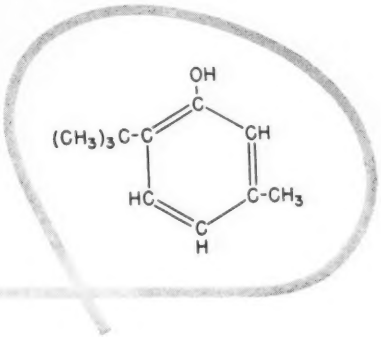
Carl B. Clifton, territory representative for The Thermoid Co., Trenton, N. J., since his release from the Army after four years of active duty, has been named southern division manager for the company, succeeding Arthur Styron, now manager of the automotive replacement sales division.

KOPPERS

MBMC

Mono-tert-butyl-meta-cresol

A NOVEL COMPOUND FOR COMMERCIAL USE



● Mono-tert-butyl-meta-cresol is a clear, liquid alkylated phenol which solidifies at temperatures slightly below room temperature. In this compound, two of the normally reactive nuclear positions are unsubstituted and can enter into reactions typical of phenol.

MBMC is useful in the following fields:

GERMICIDES and DISINFECTANTS

MBMC has a phenol coefficient of 30-50 as measured against E. typhi and Staph. aureus. The compound is useful for formulation into highly effective disinfectants.

RUBBER CHEMICALS

Sulfide and disulfide derivatives of MBMC are useful as anti-oxidants and rubber processing chemicals.

PETROLEUM CHEMICALS

Thiophosphoric esters of MBMC are of interest as additives to premium-grade lubricating oils.

SYNTHETIC RESINS

MBMC can be employed in the production of oil-soluble phenolic resins useful in surface-coating compositions and for the modification of phenolic molding materials.

PERFUMES

MBMC is an excellent raw material for the production of musk ambrette. The MBMC is first nitrated and then etherified to yield the desired product.

For detailed information on Koppers MBMC, or samples for experimental use, send the handy coupon.

Physical Properties of pure MBMC

Form	Clear liquid
Empirical Formula	$C_{11}H_{16}O$
Freezing Point	21.3°C
Boiling Point	244°C
Specific Gravity—80°C	0.922

Soluble in common organic solvents and aqueous potassium hydroxide.

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Company.....

Position.....

Address.....

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KOPPERS COMPANY, INC.
Chemical Division
Pittsburgh 19, Pa.

Patents and Trade Marks

APPLICATION

United States

2,454,809. **For an Electric Cable Insulation Including Finely Divided Diatomaceous Silica Incorporated in a Binder of Strong and Flexible Insulating Material.** S. R. Hartstein, New Brunswick, N. J., and F. Stolte, St. Albans, assignors to Federal Telephone & Radio Corp., New York, both in N. Y.

2,454,960. **Distortable Molded Plastic Freezing Tray.** H. C. Berkeley, Dayton, O., assignor to General Motors Corp., Detroit, Mich.

2,454,963. **Panty Girdle with Elastic Trunk Portion and Crotch.** L. Combs, Philadelphia.

2,455,202. **Packing Unit, Including a Circular Skeleton of Sheet Material about Which Is Molded Resilient Packing Material.** C. Ware, Houston, Tex.

2,455,248. **Balloon, Including an Elongated Casing and an Elongated Bladder of Elastic Material in the Casing.** J. A. Hagen, Glen Rock, L. Prendergast, Passaic, and E. L. Gregor, Ramsey, assignors to Molded Latex Products, Inc., Passaic, all in N. J.

2,455,272. **Panty Girdle, Including Side Sections.** J. E. Robbins, assignor to Porrette Corsets Inc., both of New York, N. Y.

2,455,343. **In a Universal Joint, Including a First Member Having a Ball Portion and a Second Member Having a Socket, a Rubber Shell Formed of Mating Parts and Mounted in the Socket.** F. W. Slack, Detroit, and C. C. Utz, Magnolia, assignors to Chrysler Corp., Highland Park, all in Mich.

2,455,366. **In an Ice Tray, Partitions of Easily Distortable Rubber, Which Has Incorporated in It a Substance That Will Migrate to the Surfaces of the Partitions to Form Water-Repellent, Slippable Surfaces.** H. Y. Jennings, Clio, assignor to Copeman Laboratories Co., Flint, both in Mich.

2,455,430. **In an Animated Toy with a Hollow Base, an Elastic Member of Sponge Rubber in the Upper Part of the Base.** C. Luckhaupt, Jamaica, N. Y.

2,455,558. **In a Toy Gun, an Elastic Band Projector and Cap Exploder.** T. F. Burton, Brentwood, Mo.

2,455,664. **In a Strut Terminal for Metal-Bending Jacks, a Cushioning Body of Firm, yet Yielding Rubber.** W. H. Ferguson, Malden, and J. J. W. Geddes, Boston, assignors to H. K. Porter, Inc., Everett, all in Mass.

2,455,705. **Golf Tee of Plastic Material.** J. C. Seager, Hartsdale, N. Y.

2,455,708. **For Damping Vibrations of Heat Exchange Fins Projecting from a Body, Means Including a Member with Spaced Projections of Rubber-Like Material Extending therefrom for Reception between the Fins.** P. S. Sherwin, Fair Lawn, N. J., assignor to Wright Aeronautical Corp., a corporation of N. Y.

2,455,775. **Electric Cable, Including Two Conductors, an Individual Rubber Jacket Surrounding Each Conductor, a Rubber Sheath Enclosing Both, and a Breaker Strip of Rubber Faced with Fibrous Material Extending the Length of the Cable between the Conductors and Bonded to the Rubber Sheath at the Edges.** R. A. Johnson, Marion, Ind., assignor to Anaconda Wire & Cable Co., a corporation of Del.

2,455,801. **Close-Fitting Rubber Boot.** F. F. Olson, Sudbury, Mass., assignor to B. F. Goodrich Co., New York, N. Y.

2,455,802. **Closure Liner Facing Material of High Tensile Strength, Free of Flavor Characteristics, and Consisting of a Mixture of an Oleoresinous Base and Vinyl Resins.** E. C. Pfeffer, Jr., Troy, assignor to Continental Can Co., Inc., New York, both in N. Y.

2,455,834. **Inflatable Solar Still.** A. E. Ushakoff, Newton, Mass., assignor, by direct and mesne assignments of 35% to S. A. Baron, New Orleans, La., for the benefit of himself and F. A. Middleton.

2,455,835. **Inflatable Still.** A. E. Ushakoff, Beverly, Mass., assignor of 35% to S. A. Baron, New Orleans, La., for the benefit of himself, F. A. Middleton, and J. J. Finnorn.

2,455,859. **Artificial Sphincter.** F. E. B. Foley, St. Paul, Minn.

2,344,982. **Composite Sealing Washer.** G. H. Dowty, Cheltenham, England.

2,456,005. **Heat-Molded, Resin-Bonded Composite Product for Use in Aircraft Construction.** J. C. MacKinnon, Wellesley, and W. R. Hickler, Winthrop, both in Mass., assignors to B. F. Goodrich Co., New York, N. Y.

2,456,015. **Electrical Conductor, Including Conducting Wires Encased in Elastic, Nonductive Material, Embedded in a Rope Structure of Strands of Twisted Filaments of Stretchable, Non-Metallic Material.** K. L. Orser, assignor to Columbian Rope Co., both of Auburn, N. Y.

2,456,075. **Rod Deck Screen with Rubber-Covered Cylindrical Clamping Means.** R. C. Newhouse, Wauwatosa, Wis., assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis.

2,456,087. **Rubber Grommet.** E. V. Schneider, assignor to Alliance Mfg. Co., both of Alliance, O.

2,456,118. **Annular Masses of Deformable, Fluid Impervious, Electrically Insulating Material in a Terminal Member and Seal for an Appertured Container Housing an Electrical Element.** C. J. Foster, assignor, by mesne assignments, to T. Hawkinson and H. Burnett, co-partners trading as Crimp Seal Products Co., all of Chicago, Ill.

2,456,130. **Breathing Apparatus.** C. J. Lambertsen, Scotch Plains, N. J.

2,456,206. **Rubber Splash Guard for Footwear.** G. Martinelli and H. M. McMann, Indianapolis, Ind.; McMann assignor to Martinelli.

2,456,219. **Inductive Device Coated with Tetraethylene Glycol Dimethacrylate Containing Insulating Particles to Seal It from Moisture.** J. Shaheen, West Roxbury, assignor to Sylvania Electric Products, Inc., Salem, Mass.

2,456,356. **In a Fluid Pressure Apparatus, Including a Pair of Movable Elements, One of Which Has a Packing Groove Concentric with the Adjacent Wall of the Other Element, Coating Restraining and Actuator Rings of Elastomeric Material.** J. S. Aber, Philadelphia, Pa.

2,456,373. **Electrically Conductive Rubber Flooring Material.** W. E. Campaigne, assignor to Wingfoot Corp., both of Akron, O.

2,456,467. **Laminated Transparent Plastic, Including Sheets of Polymethyl Methacrylate and an Intermediate Sheet of Flexible Polyvinyl Butyral.** D. A. Swedlow, North Hollywood, Calif., assignor, by mesne assignments, to Shellmar Products Corp., Chicago, Ill.

2,456,483. **Container for Lubricating Oils and the Like Proofed to Prevent Seepage and Including a Non-Metallic, Deformable Body, a Lining of Separate, Preformed Sheet Proofing Material, a Resilient and Flexible Film of Adhesive Material, and Flanged, Deformable Top and Bottom Caps.** R. Beattie, Plainfield, assignor to Tide Water Associated Oil Co., Bayonne, both of N. J.

2,456,486. **Inside Storm Window with a Continuous Resilient Rubber Frame.** M. W. Berghoff, La Fayette, assignor by direct and mesne assignments, to B-J Co., Inc., West Lafayette, both in Ind.

2,456,518. **V-Belt Drive.** E. K. Lofton, Lake Bluff, Ill., assignor to Dayton Rubber Co., a corporation of O.

2,456,529. **Sealing Device, Including a Body Having an Annular Groove and Sealing Means therein Consisting of Segments and a Rubber Ring with Staggered Recesses in Its Opposed Edges.** J. Naab, Easton, Pa., assignor to Ingersoll-Rand Co., New York, N. Y.

2,456,659. **Laminated Shoe Sole, Including a Stripping of Rubber-Like Material.** W. Weidner, New York, N. Y.

2,456,959. **Rubber Foot Members in a Lathe and Motor Base for Watchmakers' Lathes.** E. M. La Mont and B. M. Fry, both of Leavenworth, Kan.

2,456,972. **Container Closure, Including a Self-Adherent Solid, Pit-Free Vulcanized Elastomer Sealing Element.** H. G. Maeder, Jr., Belmont, and M. R. Day, North Scituate, assignors to Dewey & Almy Chemical Co., North Cambridge, all in Mass.

2,457,015. **Rubber Heel.** T. v. d. Veen, Amsterdam, Netherlands.

2,457,044. **Breath Diverter Face Mask.** F. L. Hower, Rawson, O.

2,457,066. **In a Tank for Liquids, a Wall of Flexible Rubber-Like Material Having an Access Opening.** F. J. Pepersack, Towson, assignor to Glenn L. Martin Co., Middle River, both in Md.

2,457,071. **Waistline Control Garment of Elastic Materials.** L. Shulman, New York.

2,457,120. **In an Open-Necked Container, Closure Means, Including a Resilient Plug Having a Pair of Passages therethrough, Closed at the Top by Thin Integral Diaphragms, and a Resilient Flexible Sealing Member across the Top Wall of the Plug.** W. D. Brandon, Skokie, assignor to Baxter Laboratories, Inc., Glenview, both in Ill.

2,457,219. **Sponge Rubber Garment.** A. C. Fischer, Chicago, Ill.

2,457,244. **Medical Appliance for Control of Enemata, Including a Rectal Pipe, an Inflatable Element of Rubber over the Forward End of the Pipe, an Air Duct, and Means to Hold the Inflatable Element in Place.** O. F Lamson, Seattle, Wash.

2,457,299. **Flexible Surface Covering, Including a Non-Conductive Flexible Packing, Flexible Strips of Conductive Plastic Sheet Material Secured to the Backing and Electrically Connected into a Current Conducting Grid, and Inlay of Flexible Composition Secured to the Backing and Filling the Openings.** G. K. Biemesderfer, Jr., assignor to Armstrong Cork Co., both of Lancaster, Pa.

2,457,472. **In a Packless Valve, an Annual Rubber Diaphragm.** G. H. Hufferd and G. O. R. Lindgren, assignors to Weatherhead Co., all of Cleveland, O.

2,457,507. **Flexible Shaft Coupling.** N. B. Strachovsky, assignor to Lord Mfg. Co., both of Erie, Pa.

2,457,680. **In a Thresher, a Concave Frame and a Flat Rubber Threshing Bar.** E. J. Johnson, assignor to Deere & Co., both of Moline, Ill.

2,457,706. **Resilient Mounting.** E. P. Neher, North Manchester, Ind., assignor to General Tire & Rubber Co., Akron, O.

2,457,737. **Thermoplastic Arch Support.** W. M. Scholl, Chicago, Ill.

Dominion of Canada

452,146. **Divers' Shoe.** J. Browne, assignor to Diving Equipment & Supply Co., both of Milwaukee, Wis., U.S.A.

452,160. **In Making a Laminated Storage Battery Separator, the Use of Resinous Thermoplastic Material between Pairs of Mats.** J. A. Grant, Grantville, Q., assignor to Fiberglas Canada Ltd., Oshawa, Ont.

452,223. **Clothesline Including Braided Cord in Which the Individual Strands Are Formed of a Flexible, Smooth Elastic Material.** L. G. Copeman, Motamora, Mich.

452,242. **Elastic Member in an Opening in a Mold for Freezing Stick Confections.** W. E. Neilson, Detroit, Mich., U.S.A.

452,299. **Gasket for Refrigeration Apparatus.** E. S. Wegman, East Longmeadow, Mass., U.S.A., assignor to Canadian Westinghouse Co., Ltd., Hamilton, Ont.

452,396. **In a High-Frequency Coaxial Cable, a Wrapping and an Outer Insulating Envelope of Polythene.** J. N. Dean, Brasted, and E. W. Smith, Chislehurst, assignors to Telegraph Construction & Maintenance Co., Ltd., London, all in England.

452,402. **For Connecting Two Planes, a Towing Cable Formed of Non-Conductive Elastic Material.** A. J. Sorensen, Edgewood, assignor to Union Switch & Signal Co., Swissvale, both in Pa., U.S.A.

452,410. **Electrical Conductor Cable in Which Sheaths Formed from Metal Tape Are Covered by Layers of Rubber-Asphalt Compound.** R. Gillis, Westfield, N. J., assignor to Western Electric Co., Inc., New York, N. Y., both in the U.S.A.

452,413. **Rubber-Insulated Tinsel Conductor.** G. R. Page, Baltimore, Md., assignor to Western Electric Co., Inc., New York, N. Y., both in the U.S.A.

452,429. **In a Fishing Lure Including a Hollow Rigid Buoyant Body, an Inflatable Rubber Member Attached to One End of the Body.** C. E. Hiltabidel and D. M. Yoder, both of Barberton, O., U.S.A.

452,435. **Garment Having Lower Part of Inelastic Fabric to Conceal the Lower Limbs of the Wearer, and Elastic Sections about Waist and Thighs.** E. Cadous, New York, N. Y., U.S.A.

452,502. **Rubber-Covered Wave Guide for High-Frequency Electric Currents.** D. T. Hollingsworth, assignor to British Insulated Callender's Cables, Ltd., London, England.

452,528. **Flat Power Transmission Belt Having a Leather Traction Surface to the Back of Which Is Secured Strands of Tension-Resisting Textile Cord Embedded in Rubber.** S. D. Lesesne, assignor to Graton & Knight Co., both of Worcester, Mass., U.S.A.

452,582. **Improvements in a Pressure Accumulator of the Type Containing a Collapsible Bag Holding a Buffer Gas Surrounded by a Pressure Vessel.** I. E. Weber, New Rochelle, and J. Blumenfeld, New York, both in N. Y., U.S.A.

452,599. **For Attachment to the Inclined Inside Face of a Bath Tub, a Flexible Mat with a Series of Hollow Resilient Nipples Projecting from Its Surface.** P. J. Kully, Calgary, Alta.

452,602. **Sport Glove with Elastic Back and Wrist Portions.** E. C. Lindfelt, Des Moines, Iowa, U.S.A.

452,656. **Wire Reinforced V-Belt.** R. F. Lindsay, Detroit, Mich., and A. R. Lindsay, Cleveland Heights, assignors to Dayton Rubber Co., Dayton, both in O., both in the U.S.A.

452,657. **V-Belt.** M. A. Crosby and E. L. Luaces, assignors to Dayton Rubber Co., all of Dayton, O., U.S.A.

452,681. **Garment Including Sections of Non-Elastic Fabric Joined to Sections of Porous Elastic Fabric by a Thermosetting Bonding Agent.** D. E. Morrison, Kenilworth, and P. F. Ziegler, Winnetka, both in Ill., as-

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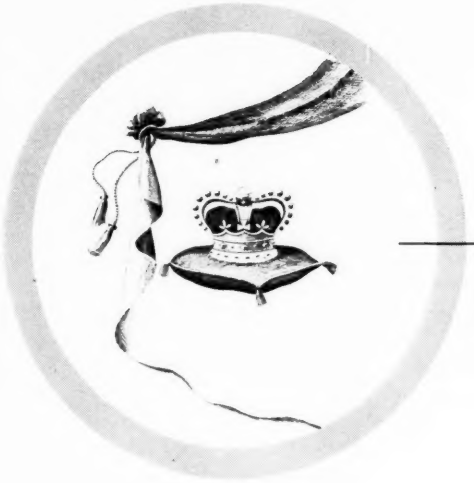

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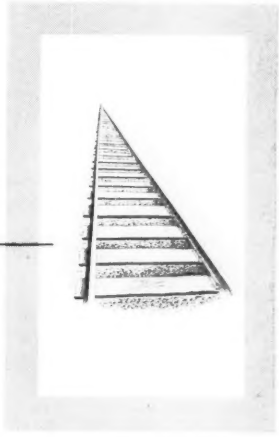
For more than a quarter of a century, Witco Stearates have been noted for their high quality. And Witco's constant research and testing methods see to it that the high quality of these stearates will always continue.



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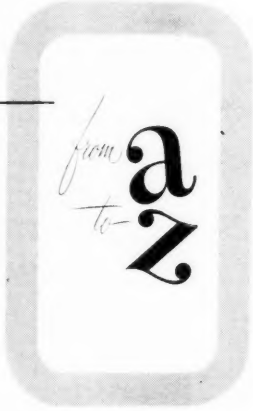

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signors to Kendall Co., Boston, Mass., both in the U.S.A.

452,741. **Inflatable Core for Use in Casting Hollow Concrete Units.** C. B. Mathews, Ilkley, York, and J. G. Ambrose, Fossebridge, Gloucester, both in England.

452,745. **Baby's Nurser and Nipple.** G. Allen and R. Dahl, both of Fairview, Montana, U.S.A.

452,815. **Dielectric Sheet Material Coated and Impregnated with Polyvinylcarbazole Resinous Material.** E. A. Kern and H. F. Miller, both of Pittsfield, Mass., U.S.A., assignors to Canadian General Electric Co., Ltd., Toronto, Ont.

452,921. **Transmission Belt Equipped with Vacuum Cups.** A. Schaeffer, assignor to E. Patrizie, both of Paris, France.

452,992. **In a Brake, Including Radially Disposed Braking Members, an Elongated Expander for Exerting Braking Pressure on the Members and Including an Open-Ended Hose Structure of Rubber-Like Material Having a Flexible Reinforcement in Its Wall.** R. J. Keller, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

453,031. **In a Hypodermic Syringe, a Rubber Plug Normally Penetrated by the Needle.** Z. M. Rocht, assignor to Mezzy, Inc., both of New York, N. Y., U.S.A.

453,084. **Snubbing-Device of Semi-Hard Rubber for a Roller Skate Shoe.** J. Bonardi, Rock Falls, Ill., U.S.A.

453,107. **Toy Balloon.** L. Perlman, Montreal, P.Q.

453,274. **Flexible Insulating Pad, Including a Mass of Fibrous Glass Having a Fabric Covering on One Side and an Impervious Preformed Film of Vinyl Resin on the Other.** L. A. Wetmore and O. R. Hoelzel, both of Fort Worth, Tex., assignors to Consolidated Vultee Aircraft Corp., San Diego, Calif., both in the U.S.A.

453,280. **For Use as the Fuel Retaining Wall in a Container for Liquid Fuels, Flexible Sheet Material, Including Layers of Fabric Bonded with One or More Layers of Synthetic, Fuel Resistant Composition and Faced on Both Sides with Plasticized Composition Containing a Polyvinyl Acetal Resin.** A. Duerden, Hale, Cheshire, and L. Shakesby, Bradmore, Wolverhampton, assignors to Imperial Chemical Industries Ltd., London, all in England.

453,289. **Adhesive Tape for Laminating Materials.** Produits Du Lynx Jaune Soc. and L. W. Eger, Perth Amboy, both in N. J., U.S.A., assignors to Johnson & Johnson Ltd., Montreal, P.Q.

United Kingdom

611,128. **Wringer Rollers of Rubber or Like Resilient Material.** T. Millen.

611,211. **Pressure-Sensitive Adhesive Sheets or Tapes.** Johnson & Johnson (Great Britain), Ltd.

611,457. **Resilient Mounting.** General Tire & Rubber Co.

611,481. **Golf Bag.** Leyland & Birmingham Rubber Co., Ltd., and A. N. Goodlet.

611,654. **Life-Saving Suits.** C. Dybbers.

611,707. **Hollow Rubber Toys.** Hungarian Rubber Goods Factory, Ltd.

611,755. **Resilient Mountings.** Dunlop Rubber Co., Ltd., and R. C. H. Russell.

611,997-998. **Tubes of Rubber or Similar Materials.** Produits Du Lynx Jaune Soc. A. R. L.

612,020. **Adhesive Sheets or Tapes.** Johnson & Johnson (Great Britain), Ltd.

612,074. **Tubular Collapsible Rivet.** B. F. Goodrich Co.

612,108. **Pressure-Sensitive Adhesive Sheets or Tapes.** Minnesota Mining & Mfg. Co.

612,614. **Windscreen Wipers.** W. E. O'Shea.

612,784. **Hot-Water Bottles.** A. J. Tattersall.

612,847. **Resilient Seats.** Firestone Tire & Rubber Co.

612,999. **Resilient Mounting for Armature Blocks.** General Tire & Rubber Co.

613,006. **Anti-Vibration Mounting.** General Tire & Rubber Co.

613,178. **Tires.** Firestone Tire & Rubber Co.

612,179. **Vehicle Suspension.** G. Spencer Moulton & Co., Ltd., and E. E. Moulton.

613,253 and 613,404. **Shock Absorbing Device.** General Tire & Rubber Co.

PROCESS

United States

2,454,785. **Urea-Aldehyde Dispersions.** L. S. Engle, Harrington Park, E. Sheridan, South Bound Brook, both in N. J., and E. K. Fischer, Long Island City, assignors to Interchemical Corp., New York, both in N. Y.

2,455,349. **Rubber-Based Textile Machine Units for Drafting Fibers.** J. W. Baumiller, Manheim Township, assignor to Armstrong Cork Co., Lancaster, both in Pa.

2,455,562. **Textile Fiber Drafting Aprons of Vulcanizable Composition Layers and Intermediate Layer of Cord.** R. A. Garrett, Lancaster Township, assignor to Armstrong Cork Co., Lancaster, both in Pa.

2,455,534. **Reticulated Structure, Including a Three-Dimensionally Open-Mesh, Unwoven Web of Fibrous Material Coated and Bonded with an Aqueous Dispersion of an Elastomer.** A. Talalay, New Haven, assignor to Sponge Rubber Products Co., Shelton, both in Conn.

2,456,006. **Resin-Bonded Composite Product.** W. R. Heckler, Winthrop, Mass., assignor to B. F. Goodrich Co., New York, N. Y.

2,456,086. **Collapsible Boat.** C. F. Schwalb, Jr., assignor to General Tire & Rubber Co., both of Akron, O.

2,456,093. **Structure of Superposed Fibrous Layers Impregnated with a Liquid Polymerizable Material.** D. A. Swedlow, Los Angeles, Calif., assignor, by mesne assignments, to Shellmar Products Corp., Chicago, Ill.

2,456,262. **Polytetrafluoroethylene Articles.** R. T. Fields, Arlington, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,456,580. **Transmission Belts.** R. S. Carter, Cuyahoga Falls, and M. L. Dorf, assignors to Wingfoot Corp., both of Akron, O.

2,456,621. **Extruding Polytetrafluoroethylene and Coating Articles therewith.** A. J. Cheney, Jr., Upper Montclair, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,457,114. **Forming Dentures from Polymerizable Acrylic Materials.** S. Amenta, Chicago, Ill.

2,457,349. **Manufacture of Pessaries from Liquid Latex.** J. F. Clark, Paterson, N. J., assignor, by direct and mesne assignments, to Durex Products Inc., New York, N. Y.

2,457,647. **Wax Treatment of Uncured Rubber Goods.** F. H. Bunn, Westfield, N. J., assignor to S. C. Johnson & Son, Inc., Racine, Wis.

2,457,647. **Rubber Articulated Joints.** H. M. Dodge, Wabash, Ind., assignor to General Tire & Rubber Co., Akron, O.

Dominion of Canada

452,846. **Continuous Method of Making Vinylidene Chloride Polymer Tubing.** W. T. Stephenson, assignor to Dow Chemical Co., both of Midland, Mich., U.S.A.

452,972. **Laminated Insulated Panel.** K. N. Mathes, Schenectady, N. Y., U.S.A., assignor to Canadian General Electric Co., Ltd., Toronto, Ont.

453,010. **Transforming Rubber to a Normally and Stably Tacky and Pressure-Sensitive Adhesive Form.** W. Kellgren, assignor to Minnesota Mining & Mfg. Co., both of St. Paul, Minn., U.S.A.

453,354. **Filling the Interstices of a Flexible Electrical Cable Containing Stranded Wires Insulated with Plasticized Vinyl Chloride Resin.** G. M. Powell, 3d, South Charleston, W. Va., and J. E. Brister, Summit, N. J., both in the U.S.A., assignors to Carbide & Carbon Chemicals, Ltd., Toronto, Ont.

United Kingdom

610,152. **Articles Coated with Organo-Silicon Compounds.** Corning Glass Works.

610,183. **Heat Treatment of Highly Polymeric Linear Esters in the Form of Fibers, Yarns, Films, Bristles, and Fabrics.** Imperial Chemical Industries, Ltd., and P. W. Carlene.

610,184. **Hot Wet Processing of Molecularly Oriented Shaped Articles from Aromatic Linear Polyesters.** Imperial Chemical Industries, Ltd., and R. G. Bartlett.

610,422. **Flexible Films, Sheets or Threads.** Ermold, Ltd., and E. H. Shaefer.

610,557. **System of Repairing Pneumatic Tires.** J. M. Esteso.

610,547. **Molded Composite Articles.** Rawpling Co. Ltd., and C. A. Taylor.

610,562. **Molding Articles in Thermosetting Molding Compositions.** Ashdowns, Ltd., and C. Lomas.

610,732. **Treatment of Rubber and Other Plastic Non-Conductors of Electricity by the High-Frequency Heating Process.** Dunlop Rubber Co., Ltd., E. F. Powell, and S. W. Gough.

610,733. **Repair of Rubber Tires.** Dunlop Rubber Co., Ltd., A. L. Adams, and S. W. Gough.

610,874. **V-Belts.** Wingfoot Corp.

610,905. **Belting.** Dunlop Rubber Co., Ltd., W. Lord, and H. Riding.

611,488. **Splicing Butyl Rubber.** Wingfoot Corp.

611,708. **Shaped Articles from a Plastic Composition.** A. H. Stevens (Columbian Rope Co.).

611,825. **Attaching Threads, Tissues, Etc. of Cellulose to Rubber.** N. V. Onderzoekingsinstituut Research.

611,828-829. **Treatment with Resinous Polymers of Fibrous Materials Consisting Wholly or Partly of Wool.** Wolsey, Ltd., and P. Alexander.

611,968. **Target Boards for Games or Sports.** Dunlop Rubber Co., Ltd., and G. Vaughan.

611,969. **Target Boards for Games or Sports.** Dunlop Rubber Co., Ltd., G. Vaughn, and R. Sowden.

612,023. **Cellular Thermoplastic Sheet Material and Receptacles therefrom.** United States Rubber Co.

612,454. **Inlaid Articles.** Dunlop Rubber Co., and T. E. H. Gray.

612,504-505. **Sheets and Coatings of Plastics.** E. V. Giles.

612,512. **Composite Products.** B. F. Goodrich Co.

612,984. **Embossing Sheets of or Fabrics Coated with Polyvinyl Compositions.** Greenwich Leathercloth Co., Ltd., and R. G. Humphreys.

CHEMICAL

United States

2,453,562. **Composition Including Heat-Curable Elastic Methylpolysiloxane.** J. G. E. Wright, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,453,569-570. **Plasticized Polyvinyl Acetal Resin.** M. O. Delacher, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,453,605. **Rendering Water-Soluble Ethers of Cellulose Water-Insoluble by Preparing an Aqueous Solution of the Cellulose Ether and Methyl Ether of Polymethylol Melamine and Heating in the Presence of an Acidic Hardening Catalyst.** H. J. West, Riverside, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,453,644. **Hot Melt Coating Composition Containing Polyethylene, Terpene Resin, Chlorinated Diphenyl Resin, and Paraffin.** W. C. Steinkraus, Chicago, Ill.

2,453,655. **In a Vinyl Carboxylate Polymerization Process, Controlling the Properties of the Polymeric Product by the Use of Thiourea Polymerization Stopper.** H. W. Bryant, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,453,665. **For Cementing a Compound Optical Element, a Polyester of Fumaric Acid.** E. L. Kropa, Old Greenwich, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,453,666. **For Cementing a Compound Optical Element, a Polyester of Maleic Acid.** E. L. Kropa, Old Greenwich, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,453,689. **Vulcanizing Rubber in the Absence of Elemental Sulfur and in the Presence of Dixanthic Sulfides.** D. J. Beaver, St. Albans, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,453,704. **Preparation of Furfuryl Alcohol-Phenolic Resins.** A. P. Dunlop, Riverside, Ill., and E. A. Reineck, Appleton, Wis., assignors to Quaker Oats Co., Chicago, Ill.

2,453,788. **Initiating the Aqueous Polymerization of a Substance from the Class of Esters and Nitriles of Acrylic and Methacrylic Acids by Means of Potassium Metabisulfite.** L. Fallows and E. V. Mellers, Spondon, England, assignors, by mesne assignments, to Celanese Corp. of America, a corporation of Del.

2,453,824. **Alpha-Acetoxymethyl Acrylonitrile Polymers.** T. F. Wood, Clifton, N. J., assignor to United States Rubber Co., New York, N. Y.

2,453,853. **Separating Butadiene from Mixtures Containing Butadiene and Acetylenes.** C. E. Morrel, Westfield, and M. W. Swaney, Cranford, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,453,858. **Obtaining Rubber from Goldenrod Leaves.** N. P. Metairie, E. F. Pollard, and J. J. Spadaro, all of New Orleans, La., assignors to the United States of America, as represented by the Secretary of Agriculture.

2,454,108. **Preparing Organic Sulfide by Reacting Organic Mercaptan with an Aliphatic Ester of a Long-Chain Fatty Acid in the Presence of Elementary Selenium.** C. T. Walling, Montclair, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,454,187. **Resinous Insulating Composition Composed of Partially Reacted Urea-Formal-**

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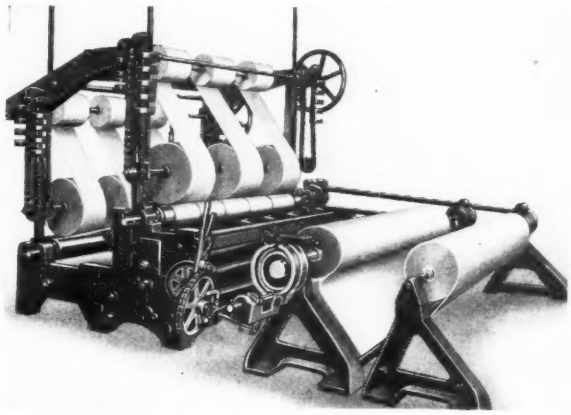

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2,454,209. **Vinyl Chloride-Vinylidene Chloride Copolymers of Increased Tensile Strength Obtained by Incorporation of Hexamethylenetetramine and a Heat-Hardenable Phenol-Aldehyde Condensation Product.** T. H. Rogers, Jr., Akron, O., and R. D. Vickers, New Rochelle, N. Y., assignors to Wingfoot Corp., Akron, O.

2,454,210. **Moldable Resinous Reaction Product Consisting of Pentaerythritol, Maleic Acid, and Phthalic Acid.** R. H. Runk, Pittsburgh, and R. D. Jerabek, Wilkinsburg, assignors to Westinghouse Electric Corp., East Pittsburgh, all in Pa.

2,454,250. **Molding Powder Including Polymerized Vinyl Aromatic Compound Blended with a Pulverulent, Incompatible, Infusible, Insoluble Aldehyde-Aminotriazine Resin.** L. M. Debing, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,454,255. **Composition Including 100 Parts of Polystyrene Resin and 100 Parts of Chlorinated Meta Diphenyl Benzene Containing 68% Chlorine; This Composition Has a Heat Distortion Temperature above That of Polystyrene.** J. R. Mares, Webster Groves, assignor to Monsanto Chemical Co., St. Louis, both in Mo.

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2,454,274. **Mixed Esters of Glycols Having Plasticizing Properties.** A. J. Daly and W. G. Lowe, Spondon, England, assignors to Celanese Corp. of America, a corporation of Del.

2,454,275. **Mixed Esters of Poly-Hydroxy Compounds.** A. J. Daly and W. G. Lowe, Spondon, England, assignors to Celanese Corp. of Del.

2,454,287. **Sealing Element Including a Binder Consisting of Polyisobutylene and Factice.** E. G. King, Pittsburgh, assignor to Armstrong Cork Co., Lancaster, both in Pa.

2,454,294. **Composition Including an Interpolymer of a Polyhydric Alcohol Mixed Ester of a Monocarboxylic Acid and a Monomeric Polymerizable Member of the Group of Vinylidene Compounds Containing a Single $CH_2{=}C<$ Radical and Saturated Alcohol Radical and Saturated Alcohol Esters of Butenedioic Acids.** J. C. Sauer, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

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2,454,349. **Treating Aqueous Waste Liquors Containing Maleic Acid to Recover the Maleic Acid.** A. Schwerdle, assignor to F. J. Sowa, both of New York, N. Y.

2,454,353. **Reacting Conjugated Dienes with 1,2 Unsaturated Aliphatic Carboxylic Acid.** F. J. Sowa, Cranford, N. J., and A. Schwerdle, New York, N. Y., assignor to Sowa.

2,454,385-387. **Fumaric Acid.** L. H. Howland, Watertown, and W. F. Brucksch, Jr., Bethany, both in Conn., assignors to United States Rubber Co., New York, N. Y.

2,454,404. **Preparation of Piperazine.** H. F. Pfann, Greenwich, and J. K. Dixon, Riverside, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,454,456-457. **Vulcanizable Rubber Materials for Dentures.** C. Joannides, Edgware, England.

2,454,486. **Vulcanizable Mixture of Styrene-Butadiene Interpolymer and the Interpolymer of Vinylidene Chloride, Butadiene, and a Copolymerizable Compound Containing a Single Ethylenic Double-Bond in Its Monomeric Molecule and Capable of Forming by Itself a Thermoplastic Polymer.** G. W. Stanton and C. E. Lowry, assignors to Dow Chemical Co., all of Midland, Mich.

2,454,506. **Combined Bituminous and Rubber Composition.** A. C. Fischer, Chicago, Ill.

2,454,515. **Light-Polarizing Sheet of Molecularly Oriented Transparent Linear High Polymer Dyed with Dichroic Substance.** E. H. Land, Boston, Mass., assignor to Polaroid Corp., Dover, Del.

2,454,541-544. **Polymeric Detergents.** L. H. Bock, Huntingdon Valley, and J. L. Rainey, Abington, assignors to Rohm & Haas Co., Philadelphia, all in Pa.

2,454,545. **Modified Phenol-Formaldehyde Condensation Product Having Surface-Active Properties.** L. H. Bock, Huntingdon Valley, and J. L. Rainey, Abington, assignors to Rohm & Haas Co., Philadelphia, all in Pa.

2,454,546. **Linear, Water-Soluble, Polymeric Surface-Active Polyesters.** L. H. Bock, Huntingdon Valley, and J. L. Rainey, Abington, assignors to Rohm & Haas Co., Philadelphia, all in Pa.

2,454,547. **Surface-Active Quaternary Ammonium Salts.** L. H. Bock, Huntingdon Valley, Pa., and A. L. Houk, San Luis Obispo, Calif., assignors to Rohm & Haas Co., Philadelphia, Pa.

2,454,655. **Rubber-Like Materials Obtained by Reacting an Aliphatic Thioaldehyde with Elementary Sulfur in Aqueous Medium.** C. A. Curtis, Manchester, and D. S. Stephens, Cheadle, both in England.

2,454,662. **Fluorodihalo Esters.** L. McGinty, Frodsham, England, assignor to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,454,737. **Rubber-Like Copolymers of Hydrocarbon Dienes and Acrylates of Alpha-Hydroxy - Methylethano-9, 10-Dihydroanthracene.** E. W. Gluesenkamp and A. B. Craig, both of Dayton, O., assignors to Monsanto Chemical Co., St. Louis, Mo.

2,454,743. **Synthetic Rubber, Which Includes a Copolymer of a Conjugated Hydrocarbon Diene and an Acrylate of a Cyclopentadienyl Alcohol.** D. T. Mowry and A. B. Craig, both of Dayton, O., assignors to Monsanto Chemical Co., St. Louis, Mo.

2,454,756. **Copolymer of Methyl Acrylate, and Furfuryl Acrylate.** C. F. Rohberg, Philadelphia, and C. H. Fisher, Abington, both in Pa., assignors to United States of America, as represented by the Secretary of Agriculture.

2,454,759. **Making a Solid Elastic Curable Methylpolysiloxane by Contacting a Liquid Polymeric Dimethylsiloxane with a Sulfuryl Halide.** M. M. Safford, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,454,795-796. **Polymerization of Rosin.** B. L. Hampton, Jacksonville, Fla., assignor, by mesne assignments, to Glidden Co., Cleveland, O.

2,454,820. **Hexachlorobutadiene.** E. T. McBee, West Lafayette, Ind., and L. W. Davaney, Beacon, N. Y., assignors to Purdue Research Foundation, West Lafayette, Ind.

2,454,851. **Insulating Material, Including High Molecular Weight Polymerized Styrene, Low Molecular Weight Polymerzed Styrene and a Plasticizer.** A. J. Warner, South Orange, N. J., and M. Bakst, Alexandria, Va., assignors to Federal Telephone & Radio Corp., New York, N. Y.

2,454,862. **Reaction Product of an Alcohol Ester of an Alkenyl-Substituted Succinic Acid with Elemental Sulfur.** G. T. Collins, Philadelphia, Pa., assignor to Allied Chemical & Dye Corp., New York, N. Y.

2,455,042. **Plasticizing Polyvinyl Chloride Compositions.** L. B. Morgan, Baguley, and P. Russell, A. A. Gibson, R. A. Kinnear, and R. G. Heyes, Welwyn Garden City, both in England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,455,198. **Non-Thermoplastic and Insoluble Films from a Polyvinyl Acetal Resin Milled with a Lower Alkyl Ether of Dimethylol Urea.** G. T. Vaala, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,455,225. **Making Thermoplastic Styrene Resin Insoluble in Aliphatic Hydrocarbon Solvents and Soluble in Aromatic Hydrocarbon Solvents by Contacting a Styrene Liquid with a Catalyst Clay, (Fuller's Earth).** S. G. Burroughs, Pittsburgh, assignors to Pennsylvania Industrial Chemical Corp., Clairton, both in Pa.

2,455,282. **Insolubilized Condensation Product of an Alphafuryl Substituted Organic Sulfonate with an Aldehyde.** J. T. Thurston, Riverside, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,455,301. **Plastic Composition Including a Polyvinyl Acetal Resin Modified by an Ester of the General Formula**

X—OOC R COO—CH_2—COO—X

in Which R Is an Alkylene Radial with 2 to 4 Carbon Atoms and X Is an Alkyl Radical with 1 to 8 Carbon Atoms. H. R. Gamrath, assignor to Monsanto Chemical Co., both of St. Louis, Mo.

2,455,342. **Solid Resinous Material Formed by Heating a Mixture Including Fumarodinitrile, Alpha-Methylstyrene and Styrene.** R. B. Seymour, Chattanooga, Tenn., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,455,392. **The Step of Adding Di(tetrahydrofurykethyl) Carbinol to Gap-Filling Adhesives Containing Amido-Formaldehyde Resin.** E. J. G. Bailey, Welwyn Garden City, F. M. Page, Newcastle under Lyme, and J. C. McGowan, Muswell Hill, assignors to Imperial Chemical Industries, Ltd., London, all in England.

2,455,402. **Preparation of Aqueous Dispersions of Polyvinyl Butyral Resin.** W. H. Bromley, Jr., Agawam, assignor to Shawinigan Resins Corp., Springfield, both in Mass.

2,455,528. **Vulcanizing a Rubber in the Presence of Sulfur and a 2-Thiazylthiomethyl Substituted Melamine.** R. B. Seymour, Dayton, O., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,455,611-614. **Compositions, Including a Polyvinyl Chloride Resin Stabilized with Ortho-Sulfobenzimide, the Alkali Metal Salts and the Alkaline Earth Metal Salts of Ortho-Sulfobenzimide, the Dialkyl Tin Salts of Ortho-Sulfobensimide, or the Lead Salt of Ortho-Sulfobenzimide.** R. H. Schlattman, Richmond Heights, Mo., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,455,652. **Nuclear Halogenated 4,4'-Bis-(Alkenyl Carbonato) Diphenyl Alkanes and Polymers thereof.** J. A. Bralley, Akron, and F. B. Pope, Cuyahoga Falls, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,455,653. **4,4'-Di(Allylcarbonato) Diphenyl Sulfone.** J. A. Bralley, Akron, and F. B. Pope, Cuyahoga Falls, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,455,665. **Low-Temperature Polymerization Process.** W. W. Ford, and F. D. Thiel, both of Baton Rouge, La., assignors to Standard Oil Development Co., a corporation of Del.

2,455,671. **High Molecular Weight Polymers.** A. D. Green, Cranford, N. J., assignors, by mesne assignments, to Jasco, Inc., a corporation of La.

2,455,674. **Vinylidene Chloride-Vinyl Chloride Copolymer Stabilized against the Injurious Effect of Light by 2-Hydroxy-5-Chloro-Benzophenone-2-Carboxylic Acid.** C. B. Havens, Hope, assignor to Dow Chemical Co., Midland, both in Mich.

2,455,677. **Preparation of Vinylacetylenes.** J. T. Horeczy, Cedar Bayou, Tex., assignor, by mesne assignments, to Standard Oil Development Co., Elizabeth, N. J.

2,455,689. **Composition Stabilized against Autopolymerization and Including a Nitrile from the Group of Acrylonitrile, Alpha-Substituted Acrylonitriles, and Beta-Substituted Acrylonitriles, and a Cyanohydrin.** K. E. Marple, Oakland, and B. Borders, assignors to Shell Development Co., both of San Francisco, both in Calif.

2,455,697. **Thin Flexible Product Having Superior Resistance to Crystallization on Aging, from Neoprene Latex Compounded with Magnesium Oxide, Zinc Oxide, and Liquid Heptylated Diphenylamine.** P. F. Niessen, Canal Fulton, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,455,703. **Purifying a Crude Nuclear-Chlorinated Alkylidene Bis-Phenol by Steam Distillation.** L. F. Reuter, Elyria, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,455,714. **Method of Coagulating a Latex Obtained by the Aqueous Emulsion Polymerization of a Mixture of Butadiene and Acrylonitrile.** W. W. Waterman, Cranford, and E. O. Ohsol, Rahway, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,455,722. **Polymeric Beta, Gamma-Olefinic Alcohols.** D. E. Adelson and H. F. Gray, Jr., both of Berkeley, assignors to Shell Development Co., San Francisco, both in Calif.

2,445,731. **Resinous Condensates of Beta-Propionolactone and Polyhydroxy Compounds.** J. R. Caldwell, Kingsport, Tenn., assignor to Eastman Kodak Co., Rochester, N. Y.

2,455,745-746. **Stabilization of Styrene and Polymerizable Ring Chlorinated Styrenes by Incorporating a 2,5-Di-Alkoxyhydroquinone or a 2,5-Disubstituted Hydroquinone in Which the Substituents Are Alkyl or Aralkyl Radicals.** E. R. Erickson, Niagara Falls, N. Y., assignor to Mathieson Chemical Corp., a corporation of Va.

2,455,778. **Copolymers of 1-Acyloxy-1,3-Butadienes and Acrylonitrile.** W. O. Kenyon and C. C. Unruh, assignors to Eastman Kodak Co., all of Rochester, N. Y.

2,455,854. **Corrosion-Resistant, Strippable Coating Composition, Including Polychloroprene, a Curing Accelerator, Finely Divided Aluminum Powder and a Liquid Vehicle Containing a Solvent for the Chloroprene.** G. E. Conde, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,455,855. **Strippable Coating Composition, Including Polychloroprene and a Stripping Agent from the Group of Soya Lecithin, a Lead Soap of Petroleum Oil Acids, and a Stearyl Alcohol Ester of a Styrene-Maleic Anhydride Reaction Product.** C. G. Murphy, Metuchen, and J. P. Sermattei, Matawan, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,455,856. **Strippable Coating Composition, Including Polychloroprene and Carbon Black.** C. G. Murphy, Metuchen, and J. P. Sermattei, Matawan, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,455,873. **Modified Wax-Compatible Ethylene Glycol-Tetrachlorophthalate Resins.** B. W. Nordlander and W. E. Cass, both of Schenectady, N. Y., assignors to General Electric Co., a corporation of N. Y.

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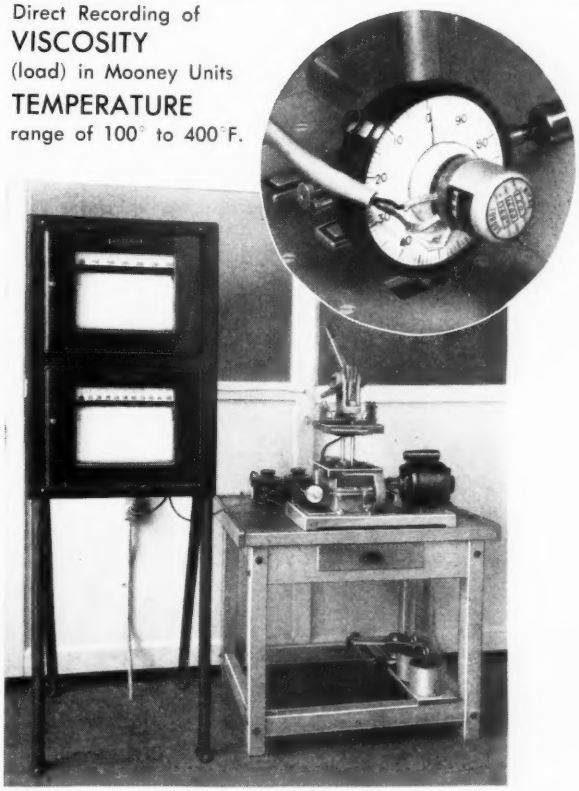

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2,455,879. **Organic Lead Salt Stabilizers for Vinyl Halide Resins.** M. M. Safford, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,455,880. **Lead Silanolate Stabilizers for Vinyl Halide Resins.** M. M. Safford and E. L. Mincher, Schenectady, N. Y., assignors to General Electric Co., a corporation of N. Y.

2,455,890. **Improved Composition Including Polystyrene and Mineral Oil Extract.** E. W. M. Fawcett, A. Millem, and N. Mulhern, all of Sunbury-on-Thames, assignors to Anglo-Iranian Oil Co., Ltd., London, all in England.

2,455,910. **Curing Ethylene Polymers.** W. L. Alderson, Jr., assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,455,911. **Self-Curing Composition, Including a Solution of Polychloroprene Containing a Heavy Metal Xanthate Derived from an Unsubstituted Aliphatic Alcohol Having 1 to 8 Carbon Atoms.** L. S. Bake, Penns Grove, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,455,912. **Polymerized Tetramethylethylene Oxide.** T. L. Cairns and R. M. Joyce, Jr., assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,455,983. **Polymers from Carbylamine and Carboxylic Compounds.** H. Dreyfus, London, England; C. Bonard, administrator of H. Dreyfus, deceased, assignor to Celanese Corp. of America, a corporation of Del.

2,456,069. **Adjusting the pH of Synthetic Rubber Latices.** H. K. Livingston, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,456,154. **Vulcanizing Rubber in the Presence of a Dihydro Polycyclic p-Hydroquinone of Condensed Ring Structure.** W. Scott, deceased, late of Akron, O., by R. P. Scott, executrix, assignor to Wingfoot Corp., both of Akron, O.

2,456,176. **Monomeric Addition Products of Azobisformates and Polyfluoroethylenes.** R. D. Cramer, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,456,177. **N-Alkyl Polymeric Amic Acids and Coating Compositions Containing Them.** M. E. Cupery, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,456,192. **Continuous Process for the Manufacture of Synthetic Resins.** H. G. Boulton, assignor to Girdler Corp., both of Louisville, Ky.

2,456,216. **Chlorine-Containing Vinyl Resins Stabilized with a Tri-(2-Alkenyl)-Phosphite and a 1,2-Epoxy Compound.** H. J. Richter, Glen Ellyn, Ill., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,456,231. **Chlorine-Containing Vinyl Resins Stabilized with a Tri-(2-Alkenyl)-Phosphite.** R. H. Wiley, Chapel Hill, N. C., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,456,243. **Emulsion Polymerization of 2-Chloro-1,3-Butadiene in the Presence of a Tetraalkyl-p,p'-Diamino-Diphenyl Methane.** R. S. Barrows, Claymont, Del., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,456,251. **As Binder in a Composite Mica Insulation, the Thermal Reaction Product of Ethyl Silicate and a Resinous Material Containing at Least One Resin of the Group of Polyvinyl Acetate, Acrylic Resin, and Polystyrene Resin.** W. A. Boughton, Fort Lauderdale, Fla., and C. L. Dawes and W. R. Mansfield, both of Cambridge, Mass., assignors to W. A. Boughton, C. L. Dawes, W. R. Mansfield, F. C. Hughes, and D. M. Hill, trustees of the Mica Patents Trust.

2,455,255. **Polymers of Trifluoroethylene.** D. D. Coffman and T. A. Ford, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,456,265. **Polymerization Process in Which Liquefied Isobutylene, Liquefied Ethylene and Zinc Stearate Are Mixed and Polymerized by the Application of a Friedel-Crafts Active Halide Catalyst.** P. K. Frolich, Westfield, N. J., assignor, by mesne assignments, to Jasco, Inc., a corporation of La.

2,456,344. **Polyamides Plasticized with a Mixture of Phenol and Ester-Type Plasticizers.** G. T. Vaala, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,456,354. **Copolymers of Isobutylene and a Dialkyl Thiophene-1,1-Dioxide.** D. W. Young, Roselle, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,456,366. **Plastic Composition, Including a Polyvinyl Acetal and a Primary Alkyl Acyl Glycolate.** B. C. Bren, West Caldwell, and J. O. White, Arlington, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,456,382. **Copolymer of Cycloexyl Alpha Chloroacrylate and Butadiene-1,3.** A. M. Clifford, Stow, assignor to Wingfoot Corp., Akron, both in O.

2,456,413. **Polyvinyl Acetal Resin Plasticized with a Terphenyl.** R. H. Hunt, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,456,452. **2-Chloroindone.** N. V. Seeger, Cuyahoga Falls, assignor to Wingfoot Corp., Akron, both in O.

2,456,452. **2-Chloroindone.** N. V. Seeger, Cuyahoga Falls, assignor to Wingfoot Corp., Akron, both in O.

2,456,454. **Composition, Including a Volatile solvent, and a Mixture of Butadiene-Acrylonitrile Copolymer and Vinylidene Chloride-Acrylonitrile Copolymer.** R. J. Signer, assignor to Visking Corp., both of Chicago, Ill.

2,456,462. **Stabilization of Polyvinyl Butyral Resins.** G. S. Stamatoff, Nutley, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,456,517. **Alpha-Acyl-aepha-(2-cyanoethyl) Succinic Acid Ester.** E. C. Ladd, Passaic, and H. W. Paxton, Lodi, both in N. J., assignors to United States Rubber Co., New York, N. Y.

2,456,529. **Coagulating Polychloroprene Latex Containing Zinc Oxide with an Aqueous Solution Including Hydroxyacetic Acid and Hydrochloric Acid.** D. G. Slovin, Providence, R. I., assignor to United States Rubber Co., New York, N. Y.

2,456,543. **Preparing Butnae-1,2,4-Tricarboxylic Acid.** P. O. Tawney, Passaic, N. J., assignor to United States Rubber Co., New York, N. Y.

2,456,558. **Mass Polymerization of Styrene and Related Compounds.** S. E. Glick, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,456,565. **Vinyl Resin Stabilized against Light by Tri-Parachlorophenyl Stibine.** H. F. Park, East Longmeadow, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,456,627. **Polysiloxane Resins.** C. D. Doyle, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,456,628. **New Thermosetting Resin from Resorcinol and a Partial Condensation Resinification Product of Furfuryl Alcohol.** A. P. Dunlop, Riverside, Ill., and E. A. Reineck, Appleton, Wis., assignors to Quaker Oats Co., Chicago, Ill.

2,456,629. **Synthetic Resin Produced from a Tung-Oil-Maleic Anhydride Adduct Esterified with Mannitol to Yield an Infusible Gelatinous Ester, Which Is Then Reacted with Sulfuryl Chloride.** G. B. Gehrenbeck, White Bear Lake, assignor to Minnesota Mining & Mfg. Co., St. Paul, both in Minn.

2,456,647. **Unsaturated Resin Obtained by Copolymerizing an Alkenyl Acrylate with a Lower Alkyl Ester of Acrylic Acid in the Presence of a Polymerization Regulator from the Group of Mercaptans and Carbon Tetrachloride.** C. E. Rehberg, Glenside, and C. H. Fisher, Abington, both in Pa., assignors to the United States of America, as represented by the Secretary of Agriculture.

2,456,671. **Flexible Wrinkle-Coated Materials Obtained from a Mixture of Unsaturated Fatty Oil with Varnish Solvent and Aqueous Synthetic Rubber Latex.** N. T. Beynon, Dayton, O., assignor to New Wrinkle, Inc., Wilmington, Del.

2,456,717. **Impregnating and Coating Composition with Good Electrical Properties from Coumarone-Indene Resin, Cetyl Acetamide and Ethyl Cellulose.** W. P. Lowden, Pitman, N. J., assignor to Radio Corp. of America, a corporation of Del.

2,456,759. **Acetylene Tetramethacrylate.** J. O. White, Arlington, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,456,919-920. **Water-Resistant Resin from Aniline Formaldehyde Resin, a Polyglycol Dichloride and a Metal or Metal Oxide.** L. Coes, Jr., Brookfield, assignor to Norton Co., Worcester, both in Mass.

2,456,921. **Water-Resistant Resin from Aniline Formaldehyde Resin, a Polyglycol Dichloride and a Salt of a Weak Acid.** L. Coes, Jr., Brookfield, assignor to Norton Co., Worcester, both in Mass.

2,457,003. **As Bonding Agent in a Friction Element for Vehicular Brakes, the Heat Reaction Product of a Mixture, Including Natural, Reclaimed, or Synthetic Rubber, a Vulcanizing Agent, a Heat-Reactive Phenolic-Aldehyde Resin, and Polymerized Cashew Nut Shell Liquid.** R. E. Spokes, Ann Arbor, Mich., assignor to American Brake Shoe Co., New York, N. Y.

2,457,035. **Heat Stabilized Composition, Including Polyvinyl Chloride, a Basic Lead Salt and Finished Composition of an Ester from the Group of Monoalkyl Maleates.** J. R. Darby, Richmond Heights, Mo., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,457,097. **A Latex, Including an Aqueous Dispersion of a Polymerization-Cross-Linked Product of Butadiene and Styrene and of a Polymerization Product of Butadiene and Styrene Having Relatively Few Cross-Links.** T. A. Te Grotenhuis, Olmsted Falls, O.

2,457,209. **Resinous Composition, Including Formaldehyde-Modified Polymethylene-Diamine-Carbon Bisulfide Reaction Product.** W. B. Clark, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,457,224. **Crystalline Homopolymers of 1,3-Dioxolane.** W. F. Gresham, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,457,229. **Dialkyl Ether Ethylene Reaction Product.** W. E. Hanford, Easton, Pa., and J. R. Roland, assignors to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,457,238. **Fractionation of Polymeric Ethylene.** E. Hunter and R. B. Richards, Northwich, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,457,261. **Preparation of Polyinyl Acetal Resins.** G. O. Morrison, F. P. Lossing, A. H. Heatley, and J. F. L. M. Germain, all of Shawinigan Falls, assignors to Shawinigan Chemicals Ltd., Montreal, both in Prov., Ca.

2,457,271. **Modification of Preformed Monoolefin Carbon Monoxide Polymers.** P. S. Pinkney, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,457,279. **Modification of Preformed Monoolefin-Carbon Monoxide Polymers by Reaction with Basic Compounds.** S. L. Scott, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,457,306. **Polycyclic Unsaturated Synthetic Resins Solid at Temperatures below 120° C. from Hexadiene-1:5.** H. Dreyfus, London, England; C. Bonard, administrator of H. Dreyfus, deceased, assignor to Celanese Corp. of America, a corporation of Del.

2,457,331. **In Vulcanizing Isobutylene Rubbers, the Step of Incorporating into the Mix Containing Sulfur and a Thiuram Sulfide or Dithiocarbamate Accelerator, an N-Nitroso-p-Nitrosoaniline.** J. H. Trenagnier, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,457,335. **Increasing the Surface Tackiness of Unvulcanized Synthetic Rubber by Incorporating a Salt Formed by Reacting a Rosin Acid with an Amine of the Group of Cetyl Dimethylamine, Dioctylamine, and Ethanolamines.** I. Williams and C. A. Carlton, both of Borger, Tex., assignors to J. M. Huber Corp., New York, N. Y.

2,457,357. **Adhesive Which Is the Reaction Product of Concentrated Waste Liquor of the Sulfite Pulp Process and Phosphoric Acid.** J. E. Fenn, Baldwin, N. Y.

2,457,361. **Separating Styrene from a Mixture Derived from the Dehydrogenation of Ethyl Benzene to Styrene.** T. A. Gadwa, Mount Vernon, assignor to Lummus Co., New York, both in N. Y.

2,457,493. **Phenol-Aldehyde Reaction Products.** D. V. Redfern, assignor to American-Marietta Co., both of Seattle, Wash.

2,457,529. **Treatment of a Preformed Methylpolysiloxane to Obtain a Methylpolysiloxane of Higher Molecular Weight.** J. R. Elliott and R. H. Krieble, both of Schenectady, N. Y., assignors to General Electric Co., a corporation of N. Y.

2,457,542. **Thickening Latex.** V. Golden, Chatham, N. J., assignor to Patent & Licensing Corp., New York, N. Y.

2,457,603. **Polyvinyl Ester of an Organo-Boronic Acid.** P. L. Salzberg and F. K. Signaigo, Brandywine Hundred, Del., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,457,656. **Polymerizable Composition for Impregnating Castings Including Styrene and a Reaction Product of Diethylene Glycol, Maleic Acid, and Linseed Oil Acids.** S. E. Glick, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,457,661. **Subjecting Vinyl Alkyl Ethers in the Presence of an Inert Organic Diluent to the Action of Gallium Trichloride to Promote Polymerization.** F. Grosser, Easton, Pa., assignor to General Aniline & Film Corp., New York, N. Y.

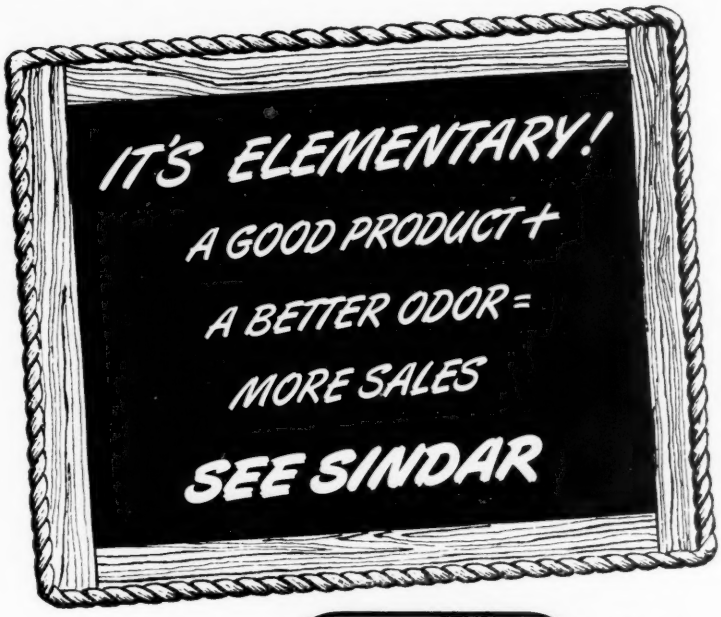
2,457,677. **Liquid Organopolysiloxanes.** J. F. Hyde, assignor to Corning Glass Works, both of Corning, N. Y.

2,457,684. **Recovering a Stable Composition from Ungelled Polychloroprene Latex Foam Containing Zinc Oxide and Alkali Silicofluoride.** N. A. Klemp, Mishawaka, Ind., assignor to United States Rubber Co., New York, N. Y.

2,457,688. **Solid, Elastic Curable Methylpolysiloxane.** R. H. Krieble and J. R. Elliott, both of Schenectady, N. Y., assignors to General Electric Co., a corporation of N. Y.

2,457,701. **Use of a Quinone in the Preparation of a Synthetic Rubber Latex by Emulsion Polymerization of Butadiene-1,3 Hydrocarbons.** C. D. McCleary, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,457,738. **Thermoplastic Resin Which Is the Condensation Product of a Dialkylol Melamine and a Parasubstituted Phenol.** M. J. Scott, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.



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Latex and Latex Compounds

for all purposes

2,457,769. **Resinous Ester of a Polyhydric Alcohol and Copolymer of Styrene and an Oil Soluble Natural Resin.** J. A. Arvin, Homewood, and W. B. Gitchel, Chicago, both in Ill., assignors to Sherwin-Williams Co., Cleveland, O.

MACHINERY

United States

2,455,038. **Apparatus for Building Tires.** W. J. Breth, assignor to General Tire & Rubber Co., both of Akron, O.

2,455,637. **Vulcanizing Apparatus.** W. C. Wright, D. G. Rowe, Jr., and E. F. Roberts, all of Hickory, N. C.

2,456,063. **Tire Retreader.** H. V. James, Denver, Colo.

2,456,113. **Apparatus to Form an Extensive Conveyer Belt Article.** J. A. Dorner, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,456,141. **Apparatus for Extrusion Molding of Plastic Articles.** S. Myerson, Brookline, Mass.

2,456,423. **Injection Molding Machine.** C. Jobst, assignor, by mesne assignments, to Owens-Illinois Glass Co., both of Toledo, O.

2,456,699. **Device to Shear Strips of Plastic Material.** E. D. Hanson and O. G. Nelson, both of Baltimore, Md., assignors to Western Electric Co., Inc., New York, N. Y.

2,456,704. **Device to Test and Mark Insulated Conductors.** G. E. Henning, Baltimore, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,456,778. **Injection Molding of Plastic Material.** J. E. Gilchrist, Chicago, Ill.

2,457,356. **Injection Molding Machine.** G. C. Wilson, assignor to Armstrong Cork Co., both of Lancaster, Pa.

2,457,659. **Apparatus for High-Speed Welding of Thermoplastic Films.** J. P. Graham and H. L. Hearns, assignors to Dow Chemical Co., all of Midland, Mich.

2,457,687. **Apparatus to Form Hollow Articles of Organic Plastic Materials.** W. H. Kopitke, West Hartford, assignor to Plax Corp., Hartford, both in Conn.

2,457,788. **Film Extensibility Tester.** J. A. Van den Akker, Appleton, Wis., assignor, by mesne assignments, to the United States of America, as represented by the Secretary of War.

Dominion of Canada

452,810. **Non-Metallic Plastic Materials Extruder.** J. L. Parker, Roby, and H. MacD. Steward, Liverpool, assignors to British Insulated Cables, Ltd., Prescot, the latter in Liquidation by D. McKellar, liquidator, assignor to British Insulated Callender's Cables, Ltd., both of London, all in England.

452,889. **Vulcanizing Mold.** R. W. Brown, assignor to Firestone Tire & Rubber Co., both of Akron, O., U.S.A.

453,076. **Patch Vulcanizer.** A. D. Slatkin, Toronto, Ont.

455,093. **Portable Appliance for Vulcanizing Tires, Etc.** H. C. Fenton Cardiff, South Wales.

455,249. **Press for the Manufacture of Bodies from Synthetic Resins.** H. Studli, Winterthour, Hard, Switzerland.

459,257. **Apparatus for Molding Thermoplastic and Thermosetting Plastic Materials.** E. E. Novotny, North Wales, assignor to Durite Plastics, Inc., Philadelphia, both in Pa., assignor to Borden Co., New York, N. Y., both in the U.S.A.

UNCLASSIFIED

United States

2,455,432. **Tractor Tire Lift.** M. B. Martin, Piqua, O.

2,455,524. **Tire Deflation Indicator.** A. J. Scholz, assignor of one-half to E. Crosby, both of St. Paul, Minn.

2,455,760. **Hose Clamp.** G. Gustafson, Yakima, Wash.

2,455,878. **Tire Anti-Skid Device.** C. Sadowsky, Great Neck, N. Y., assignor to United Device Corp., New York, N. Y.

2,456,257. **Flushing Device for Douche Syringes.** W. R. Curry, Ogden, Utah.

2,456,453. **Insulation Break Detector.** D. Shailor, assignor to Briggs Mfg. Co., both of Detroit, Mich.

2,456,475. **Vehicle Tire Anti-Skid Device.** J. Turner, Boston, Mass.

2,456,544. **Anti-Skid Device.** C. E. Varner, Toledo, O.

2,457,068. **Anti-Skid Chain.** A. Peterson, Wheaton, Ill.

2,457,161. **Tire Deflation Switch.** W. C. Laidlaw, Pasadena, Calif.

2,457,208. **Traction Device for Vehicle Wheels.** G. F. Carpenter, Des Moines, Iowa.

2,457,438. **Joint for Pipe Lines.** C. E. Bennett, Ridgewood, N. J., assignor to Okonite-Callender Cable Co., Inc., Paterson, N. J.

2,457,540. **Cable Sheath Slitter.** D. F. Fasoldt, Prospect Heights, Rensselaer, N. Y.

Dominion of Canada

453,066. **Thread Feed Arresting Mechanism.** J. T. Gordon and R. E. Solliday, assignors to Wingfoot Corp., all of Akron, O., U.S.A.

453,098. **Traction Shoe for Automobile Wheels.** W. B. Gregg, Denver, Colo., U.S.A.

453,204. **Hose Coupling.** A. J. Weatherhead, Jr., Shaker Heights, O., assignor to Weatherhead Co., Cleveland, O.

United Kingdom

610,391. **Device to Facilitate the Fitting of Pneumatic Tires.** Henley's Tire & Rubber Co., Ltd., and W. Scott.

610,426. **Means for Securing Hose Couplings and Other Fittings to Hose.** British Tire & Rubber Co., Ltd., and T. A. Beazley.

610,559. **Thermally Insulated Containers.** Wingfoot Corp.

609,834. **Machine for Stripping the Insulation from the Ends of Insulated Electric Conductors.** Telegraph Condenser Co., Ltd., P. A. Sporing, and C. P. Johnson.

TRADE MARKS

United States

441,459. **Band-Ita.** Surgical adhesive bandages. Johnson & Johnson, New Brunswick, N. J.

441,465. **Zedite.** Abrasives. Bilton's Abrasives, Ltd., London, England.

441,484. **Wood Welder.** Generators for adhesives drying. J. B. Cunningham, doing business as Shortwave Plastic Forming Co., Burbank, Calif.

441,498. Representation of a pennant containing the word: **"Westpoin ."** Baseballs, footballs, etc. Oakes & Co., Chicago, Ill.

441,502. **Lastonet.** Medical and surgical supplies. John Heathcoat & Co., Tiverton, Devon, England, assignor to John Heathcoat & Co., Inc., New York, N. Y.

441,510. Representation of three circles containing scenes of figures playing ball and the words: **"Jitter Ball."** Play ball. Bayshore Industries, Inc., Elkton, Md.

441,513. **Son-Chief.** Heating pads, cord sets, etc. Son-Chief Electrics, Inc., Winsted, Conn.

441,520. Representation of a circle containing the letters: **"RCA."** Articles composed wholly or in part of natural and/or synthetic rubber for parts for recording and reproducing equipment, etc. Radio Corp. of America, New York, N. Y.

441,531. **Opticlear.** Synthetic resin coating. Mass & Wahlstein Co., Newark, N. J.

441,541. Representation of a kneeling figure and the words: **"Black Boy."** Tire paint. Manufacturers Warehouse, Atlanta, Ga.

441,551. **Rubberiex.** Rubberized wall finish. Master Mechanics Co., Cleveland, O.

551,555. **Goodall-e.** Vinyl plastic sheet or film. Goodall-Sanford, Inc., Sanford, Mass.

441,635. **Mel-Flor.** Floor covering. L. E. Warford, doing business as Melflex Products Co., assignor to Melflex Products Co., both in Akron, O.

441,659. **Koroseal.** Floor covering. B. F. Goodrich Co., New York, N. Y.

441,668. **Hedwin.** Inflatable mattresses and cushions. Hedwin Corp., Baltimore, Md.

441,671. **Cordmaster.** Insulated electric wire. Faraday Electric Corp., Adrian, Mich.

441,672. **Sportster.** Footwear. A. Sandler Co., Boston, Mass.

441,677. Representation of a dotted line broken by the letters: **"McK."** Tire chains. McKay Co., Pittsburgh, Pa.

441,681. Representation of a bomb above which are the words: **"Air-A-Tomic."** Footwear. Daly Bros. Shoe Co., Inc., Boston, Mass.

441,699. **Liberty Special.** Hose. Liberty Fire Apparatus Co., Inc., Roanoke, Va.

(Continued on page 662)

CALENDAR

Feb.	18.	Akron Rubber Group. Symposium on Industrial Fabrics. Mayflower Hotel, Akron, O.
Feb.	19-27.	National Sportsmen's Show. Grand Central Palace, New York.
Feb.	21-23.	National Sporting Goods Association of Canada. Annual Meeting, General Brock Hotel, Niagara Falls, Ont., Canada.
Feb.	21-24.	Technical Association of Pulp & Paper Industry. Hotel Commodore, New York, N. Y.
Feb.	25.	Buffalo Section, SPE. Westbrook Hotel, Buffalo, N. Y.
Feb.	25.	Cleveland Section, SPE.
Feb.	28-Mar. 4.	ASTM. Spring Meeting and Committee Week. Hotel Edgewater Beach, Chicago, Ill.
Mar.	1.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Mar.	1-31.	1949 Annual Red Cross Fund Appeal.
Mar.	2.	Western New England Section, SPE. Hotel Sheraton, Springfield, Mass.
Mar.	3.	Washington Rubber Group.
Mar.	3.	Southern California Section, SPE.
Mar.	7-18.	American Toy Fair. Hotels New Yorker and McAlpin, New York, N. Y.
Mar.	8.	New York Section, SPE. Hotel Sheraton, New York, N. Y.
Mar.	9.	Newark Section, SPE. Newark Athletic Club, Newark, N. J.
Mar.	9.	Rhode Island & Southeast Massachusetts Section, SPE. Providence Engineering Societies Bldg., Providence, R. I.
Mar.	9.	Chicago Section, SPE. Builders' Club, Chicago, Ill.
Mar.	11.	Detroit Rubber & Plastics Group, Inc.
Mar.	15.	Rochester Section, SPE.
Mar.	15.	Philadelphia Section, SPE.
Mar.	16.	South Texas Section, SPE. Houston, Tex.
Mar.	17-19.	West Coast Chapter, SPI. Annual Conference, Santa Barbara, Calif.
Mar.	22.	Washington Rubber Group.
Mar.	22.	Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.
Mar.	25.	Chicago Rubber Group. Hotel Morrison, Chicago, Ill.
Mar.	25.	Boston Rubber Group, Somerset Hotel, Boston, Mass.
Mar.	25.	Buffalo Section, SPE. Westbrook Hotel, Buffalo, N. Y.
Mar.	25.	Cleveland Section, SPE.
Mar.	25.	New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
Mar.	27-Apr. 1.	American Chemical Society. National Meeting. San Francisco, Calif.
Apr.	5.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Apr.	6.	Western New England Section, SPE. Hotel Sheraton, Springfield, Mass.
Apr.	7.	Southern California Section, SPE.
Apr.	11-13.	SAE. Aeronautical & Transport Meeting. Hotel New Yorker, New York, N. Y.
Apr.	12.	New York Section, SPE. Hotel Sheraton, New York, N. Y.
Apr.	13.	Newark Section, SPE. Newark AC, Newark, N. J.
Apr.	13.	Rhode Island Section, SPE.
Apr.	15.	Akron Rubber Group. Mayflower Hotel, Arkon, O.
Apr.	19.	Philadelphia Section, SPE.
Apr.	19.	Rochester Section, SPE.

New Machines and Appliances

New Model K Electronic Micrometer

Measuring Instrument

THE new Model K electronic micrometer, a portable working standard measuring instrument for shop use, is available for measuring fine wire, paper thickness, rubber sheet and film, paint films, and other thin materials, both hard or soft, conducting or non-conducting. Made by Carson Micrometer Corp., Little Falls, N. J., the instrument measures materials as thin as 0.0001-inch with an accuracy of 20 millionths of an inch, under anvil pressures as light as 1/4-ounce, it is claimed. Operation of the instrument is independent of operator skill or sense of touch.

The measuring range of the instrument is 1/8-inch, but the micrometer head may be raised to accommodate work up to 3/8-inch thick. Anvils are of hardened steel and may be of any diameter from 1/64- to 5/16-inch, with flat or spherical surfaces. Anvil pressure may be any value from 1/4 to one ounce. The micrometer responds to differences of less than 10 millionths of an inch, and repeats to 10 millionths. Accuracy is not influenced by anvil diameter or pressure. The electronic unit is housed in a small steel cabinet with carrying handle. Operation is unaffected by aging of tubes, vibration, or vibrations in line voltage, temperature, and humidity.

Triple-Beam Balance

A NEW triple-beam balance, featuring stainless-steel platform and beams, has been announced by Ohaus Scale Corp., Newark, N. J. In addition to the stainless-steel parts which are said to resist heat, corrosion, chemicals, and accidental sharp blows, the balance also features patented, self-alining agate bearings that insure minimum friction and full contact along the knife edges at all times, a sliding-type poise which gives stability and freedom from swinging when the scale oscillates, and a steel

PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A PHILBLACK O PHILBLACK A

Philology?

SEE PAGE 542

Accelerator 2-MT

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★ Resists flex cracking.

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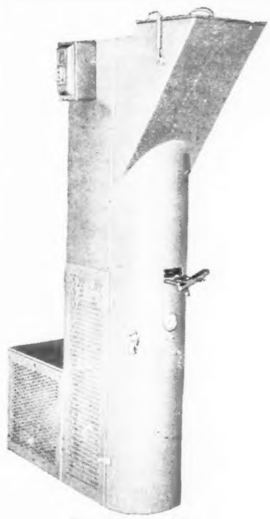

Campbell Model 1404-2

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If your dusting machine clogs up chances are moisture from factory air lines is responsible.

The Campbell 1404-2 Duster has a pump *within* the chamber which *makes* its *own* air. No connections are needed. Chamber is moisture-proof, dust-proof, air-tight. Ejects four ounces to 30 pounds of dust per hour in a mist or cloud.

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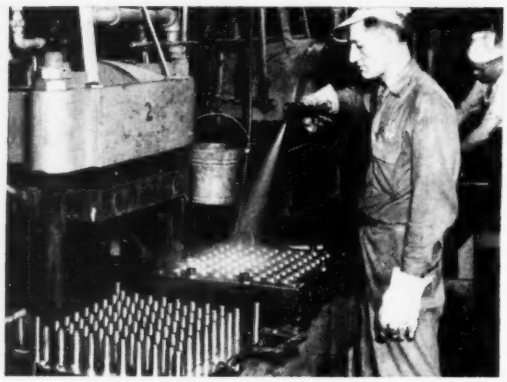

PHOTO COURTESY ANCHOR RUBBER PRODUCTS, INC.

Use of DC Mold Release Emulsion No. 35 reduced the cleaning schedule on this 81 cavity and precision pin mold from once a week to once in four months.

Before Anchor Rubber Products, Inc. of Cleveland started to use DC Mold Release Emulsion No. 35 this 81 cavity and precision pin mold had to be disassembled and cleaned every week. Ordinary lubricants carbonized to form a build-up on an undercut at the base of the pins and on the plate. Result was poor moldings and excessive scrap.

Cleaning was complicated because all of the pins had to be removed. After cleaning, the pins had to be hammered home to align and seat them properly. That formed burrs which had to be removed by grinding. And the pins had to be replaced frequently because grinding shortened them so much that the button flash at the end of the part could not be removed.

Anchor Rubber Products has cut this costly mold maintenance to a minimum by using DC Mold Release Emulsion No. 35. This silicone release agent introduced by Dow Corning gives easy release and keeps the mold clean 16 times as long.

It is equally possible for you to save most of the time, money and labor you now spend on mold maintenance and cleaning. And the cost of DC Mold Release Emulsion No. 35 is surprisingly low. In this complicated mold, 1 part of the Emulsion to 100 parts of water is required. Effective concentrations range from 35 to 400 parts of water to 1 part DC Mold Release Emulsion No. 35.

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DC MOLD RELEASE EMULSION NO. 35

FOR MORE INFORMATION PHONE OUR NEAREST BRANCH OFFICE OR WRITE FOR PAMPHLET NO. C 12 U

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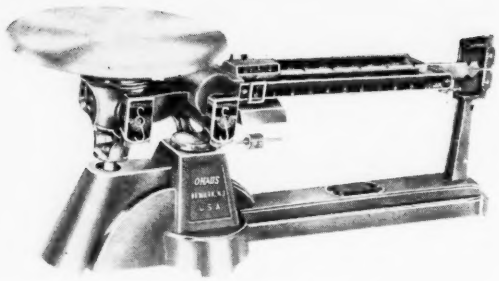
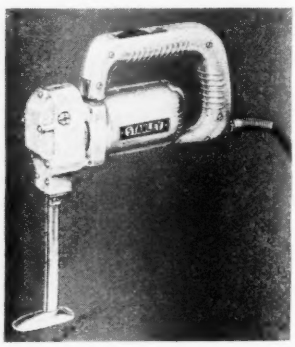


Ohaus Model No. 750-S Balance

tongue that fits into accurately milled notches at every calibration and gives correct positioning.

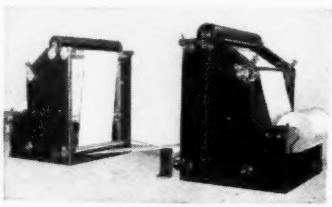
Model No. 750-S has metric calibration, as follows: front beam, 10 grams in 0.1-gram steps; center beam, 500 grams in 100-gram steps; and back beam, 100 grams in 10-gram steps. The balance has a rated sensitivity of 0.1-gram and an actual sensitivity of 1.20-gram. Scale capacity is 610 grams without attachment weights, and 2,610 grams with weights. The scale is also available in avoirdupois standard with decimal and fractional ounce calibrations.

Rubber Cutter



Stanley No. 99 Sponge Rubber Cutter

THE new No. 99 sponge rubber cutter, a portable electric tool for cutting foam or sponge rubber up to four inches in thickness, has been announced by Stanley Electric Tools, division of Stanley Works, New Britain, Conn. Using the tool, an operator can follow any pattern or template for cutting straight lines, curves, or angles. The cutter can be operated at a rate up to 30 feet a minute, depending on the thickness of the rubber. The tool is powered by a universal type A.C.-D.C. motor housed in a sturdy, lightweight aluminum alloy casting. The two saw-type cutting blades are made of alloy steel for long life and can be replaced easily.



Black Industries' Web Tension Unit

Tension Unit

A NEW machine which provides constant tension and constant velocity on a web of paper during printing has been developed by Black Industries, Cleveland, O. Similar machines, based on the same control principle, are expected to find wide application in the paper, textile, plastics, leather, and rubber industries and in the metal fabricating field using coiled strips of metal.

The machines will maintain constant tension over a wide range, from a few ounces to hundreds of pounds, to meet processing conditions, regardless of the tension in the web of material as received, it is claimed. Once set, tension is under control at all times regardless of speed and remains constant during stops in the processing operation. Machines have been built to operate at speeds as low as 60 and as high as 3,200 feet a minute. These machines, furthermore, are available as winding units, unwinding units, or both as the processing operation may require.

FAR EAST

INDONESIA

Communications from the Rubber Research Division of the N.I.R.O. (Netherlands India Institute for Rubber Research) Buitenzorg, Java, have been appearing again. In Communication No. 63, G. E. van Gils briefly discusses the use of rubber as binding material in budding. The method of using a thin film of unvulcanized rubber for binding freshly budded stock was developed in a war prison camp in Java and is now said to be widely used for all kinds of budding operations. Among the advantages of using rubber are: the elasticity of the strip, whereby damage to tender young stems due to overtight binding is eliminated; the prevention of the entry of rain water and consequent rotting; the perfect adjustability of the thickness of the rubber film to the thickness and sturdiness of the stock, and since the rubber film disintegrates after a time, there is no need to remove the bandage. Either unvulcanized or vulcanized film prepared from ammoniated latex may be used, apparently with equally good results.

According to Lockwood's *Rubber Report* of September 15, 1948, it is calculated that during the first half of 1948, Indonesia exported 194,600 long tons of rubber, of which 150,300 tons, were native rubber from both controlled and uncontrolled areas; the balance of 44,300 tons was estate rubber supplied chiefly by Java (23,700 tons) and Sumatra (18,100 tons).

Natives in the controlled areas shipped 74,200 tons, including 35,600 tons from Sumatra and 38,100 tons from Borneo; while the 76,100 tons from the uncontrolled areas were made up of 69,500 tons from Sumatra and 6,600 tons from Borneo.

On the basis of the known production figures from estates during the first half of June and the above export figures from native areas, the exportable total for all of 1948 is put at 411,000 tons, including 102,000 tons as estimated estate output, 8,000 tons as exports of old stocks, 155,000 tons exports of native rubber from controlled areas, and 152,000 tons exports from uncontrolled areas, the whole minus 6,000 tons estimated home consumption.

The advisory functions of the Netherlands Indies Rubber Bureau (N.I.R.C.B.) now in liquidation, are being transferred to a Rubber Advisory Council consisting of representatives of estate and native labor, of the rubber trade, and of remillers. The Council will have no government members outside of the chairman, who is to be appointed by the government.

According to latest information the United States Rubber Co. and the Goodyear Tire & Rubber Co. are to resume operations on some of their plantations in East Coast Sumatra. Before the war Goodyear owned and operated two large plantations in Sumatra, the Wingfoot Estates, with an area of 40,000 acres, and Dolok Merangir Estate, with an area of 20,000 acres. It is the latter plantation which the company recently regained and will reopen. The estate was captured by the Japanese early in 1942; when the Dutch reoccupied the area in 1947, the plantation came under the Netherlands Government custodian who has just turned it over to Richard C. Arnold, Goodyear's resident director, who will rehabilitate it. A survey disclosed that one-third of the planted area of 15,700 acres had been destroyed; but the remaining 10,200 acres are in good condition. The Wingfoot Estates are about 160 miles south of Dolok Merangir and may soon be available for inspection.

CEYLON

Russia's offer to buy Ceylon's 1949 rubber crop and existing stocks has become the subject of much discussion. In certain circles in Colombo it is suggested that this might be a political gesture on the part of Russia following the UN veto on Ceylon, with the implication that the Ceylon Government might be able to make use of Russia's rubber need as a lever to open the door to UN membership. It is admitted, however, that whether or not the proposed deal goes through will depend primarily on the price obtainable, and since Ceylon is a high-cost producing country and rubber prices have entered politics, so to speak, it is considered possible here that Ceylon's ideas of suitable terms for a bulk deal might not be acceptable to Russia.

Above: The "business end" of the "Magnetic" Schuster Gage; prevents major losses of time and materials by keeping constant automatic control on thickness.

Left: The "Magnetic" Control Meter; automatically corrects the mill for any variation from required thickness, eliminates the human element.

How to control thickness continuously and accurately

Most mill men now agree that the only sure way to control the thickness of rubber, plastic, and other non-magnetic materials during processing is through CONTINUOUS GAGING. *Anything short of continuous gaging is makeshift, wasteful, expensive.*

Ideal device for continuous gaging is the "Magnetic" Schuster Gage, now a product of Pratt & Whitney. The Schuster Gage never lets the thickness pass beyond the limits without corrective action. Once installed, it is easily and quickly adjusted to the desired thickness, holds it as set right through to the end of the run. Rugged, simple; virtually no parts to wear out or be replaced.

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Meanwhile rumors are afloat that the United States has made a counter offer to the Russian bid.

Total production of rubber in Ceylon during 1947 came to 89,000 tons; while exports of dry rubber, including latex, totaled 82,503 tons, the Administration Report of the Rubber Controller for 1947 reveals.

It was shown that local manufacturing firms used only about six tons a month in the manufacture of miscellaneous rubber goods and in retreading tires.

The average price per pound of rubber sheet, R.S.S. No. 1, fell from one rupee in 1946 to 35 rupee cents in June, 1947, but the government maintained a floor price which enabled producers to get 65 rupee cents per pound for their rubber. The floor price was reduced to 55 cents a pound on December 9, but the market rallied immediately afterward, and the price rose to 63 cents a pound on December 29. The price on the last day of the year was 61.73 cents a pound.

The total area newly planted to rubber during 1943-47 was 26,917 acres; the replanted area came to 2,118 acres.

Disappointing results have been obtained in recent attempts to obtain oil from rubber seeds, the Rubber Research Board discloses. Failure was chiefly due to short seed supplies at the time of the experiments. Oidium attack on the flowers and *Phytophthora* attack on the seed pods are always likely to reduce the total amount of available seed in Ceylon, and on the present occasion seed pods had suffered a severe attack of the *Phytophthora* disease.

Ceylon's rubber production in the first seven months of 1948 totaled 48,000 tons, of which 37,000 were by estates and 11,000 tons by smallholders. Rubber exports for the seven months reached 53,752 tons. Ceylon rubber latex has been enjoying an increasing demand, and exports rose successively from 33,358 pounds in May to 78,941 pounds in June and again to 138,579 pounds in July. Total latex shipments in the seven months under review were 888,311 pounds, more than 65% of which went to the United Kingdom.

Moves to reopen the Rubber Commissioner's store in Colombo and restore the system of buying rubber in Colombo by the Commissioner on behalf of the government are being opposed by shippers of rubber who claim they are unable to compete in Colombo with the Rubber Commissioner; they do not object to continued government buying at the provincial depots.

The recent decision of the Rubber Coordination Board to establish a price board which would fix a monthly price for rubber is also cause for apprehension by shippers, as in this case they fear the Rubber Commissioner would become the sole buyer for rubber in Ceylon, and naturally they protest such a monopoly.

It is noted that the recommendations of the commissioners, E. W. Whitelaw and S. F. H. Perera, embodied in their report on Ceylon's rubber industry which they had submitted on July 7, 1947, are under consideration.

Following the recommendations of the Rubber Commission, a new rubber goods factory is to be set up by the Ceylon Government. A site had been selected in Nagoda, Kalutara, not far from Colombo, on which are several semi-permanent buildings suitable for remodeling as a modern rubber goods factory. Dr. Sundaralingaman, the government's rubber technologist, will be in charge of production, which is expected to commence within a few months. Only the simpler types of rubber goods will be made, at least to start with.

MALAYA

The Government of the Federation of Malaya is understood to be forming a committee to report on the economic future of rubber smallholders and to consider the possibilities of planting or replanting holdings with high-yielding strains. In the Federal Council it was urged that the government grant loans to assist rehabilitation and replanting; speakers described the position of smallholders as alarming and emphasized the need of smallholders to adopt a progressive policy in planting. The president of the Malayan Rubber Estate Owners Association said that the government could not afford to be complacent over the future of rubber smallholders.

In the first nine months of 1948, Malayan production of various types of latex totaled 35,448 tons, the Rubber News Sheet of the Secretariat of the Rubber Study Group shows. In the first seven months of the year Malayan exports also included 4,681 tons of sole crepe, of which 103 tons were imported, presumably from Indonesia.

At an extraordinary meeting of Malayan Rubber Estate Owners, Ltd., the voluntary liquidation of the company was decided

on since the purpose for which it had been formed had been served.

In the first half of 1948, Malaya imported 230.0 tons of gutta percha, against 285.5 tons in the preceding six-month period. Exports of gutta percha for the same two periods were 376.6 and 360.1 tons, respectively. Malaya also imported 2,632.4 tons of jelutong in the first half of 1948, against 2,092 tons in the preceding half year. Exports of jelutong in the two periods were 2,317.4 and 1,998.4 tons, respectively.

INDO-CHINA

The third volume of the Cahiers I.R.C.I., papers published by the Rubber Research Institute in Indo-China, includes statistics covering the local rubber industry in 1943 and 1944 and data to show the development of the industry during the period March, 1945—June, 1947. Available figures show that at the end of 1944 the total area under rubber was 138,954 hectares (hectare equals about 2.47 acres), against 133,793 hectares at the end of 1943. On the other hand the tapped area decreased slightly from 106,426 hectares in 1943 to 105,164 hectares in 1944; while production fell from 74,792.5 metric tons in 1943 to 61,389.4 tons in 1944.

The plantings included 66 large European estates having a combined area of 102,892 hectares at the end of 1944, 415 small and medium sized European plantations covering 27,352 hectares, and 604 plantings with a combined area of 8,799.5 hectares held by Indo-China owners. Most of the rubber is in Cochinchina, where 960 plantations cover 106,587 hectares, of which 77,399 hectares were in tapping in 1944. But Cambodia, with a total rubber area of 30,471 hectares divided among 77 plantations, seems to have most of the larger estates and is known to be the location of the largest estate in all Indo-China.

Data for 1945 are sparse; all that can be said is that the arrest by the Japanese of European personnel, abandonment and destruction of plantations caused production in that year to dwindle to practically insignificant amounts. By 1946 there was some recovery, and production rose to 21,426 metric tons, of which 16,442 tons were smoked sheet; 3,571, crepes (including 842 tons of sole crepe), 700 tons of inferior grades; and 3,548 kilograms of latex (dry weight). Of the total output, about 95% came from plantations over 500 hectares. The small European plantations and the still smaller native holdings, scattered and for the most part unprotected against the depredations of rebel bands, were practically out of production.

The main difficulty on the larger estates seems to have been the shortage of labor. In January and February, 1946, less than 11% of the already reduced labor force on hand at the beginning of 1946 was available. The situation improved steadily during 1946, and at the end of the year the percentage, as compared with the figure at the beginning of 1945, was just under 50%. Deterioration of the political front during 1947 halted this upward trend, and estates again worked with somewhat reduced labor force. The situation at the end of June, 1947, as compared with that on January 1, 1945, showed 50% of the exploitable area being worked with 47.56% of the labor. Output during the first half of 1947 was 60.9% of that of the first half of 1944, but actually represented only 36% of the total productive capacity of the country.

According to figures published by *Revue Générale du Caoutchouc*,[1] the output of estates of more than 800 hectares for all of 1947 was 36,898 metric tons. Provisional figures give production during the first 10 months of 1948 as 30,702 tons, against 27,000 tons for the corresponding period of 1947. Exports for 1947 totaled 51,313 metric tons; for the first 10 months of 1948 they are estimated to have reached 35,422 metric tons, against 38,877 tons in the same period of 1947.

[1] 26, 1, 39 (1949).

INDIA

The Indian Government has approved the establishment of a tire factory at Trivandrum, Travancore State, South India. The factory is to have annual production capacity of 100,000 passenger car and truck tires, 100,000 tubes, 1,000,000 bicycle tires, besides other rubber goods. It will be capitalized at 20,000,000

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The new products have the following advantages over conventional pastes:

(1) Minimum stearic acid content insures against surface dulling and results in **brighter metallic iridescence**.

(2) Treated aluminum particles permits **excellent vinyl printing**.

(3) Elimination of solvent eliminates health and fire hazards; produces a paste which is 100% "solids"; gives uniform concentration because there is **no volatile component**.

(4) The plasticizer is completely compatible with vinyl resins thus facilitating **quick and uniform dispersion** of the aluminum powder into vinyl film.

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rupees (about $6,000,000) with the Travancore Government participating to the extent of 51% and private Indian interests providing the rest of the capital. It is understood that the new company is seeking to arrange for technical assistance on a royalty basis from a company in the United States.

According to press reports from New Delhi, a committee on profit-sharing has included the tire manufacturing industry among six in which it considers an experiment in profit-sharing may be tried for a period of five years. The committee considered 6% a fair return on capital employed which, augmented by 50% of the "surplus" profit, would permit the distribution of reasonable dividends. Under the scheme labor would get the remaining 50% of the "surplus" profit.

The Government of India raised ceiling prices for all types of raw rubber in response to demands by planters. The new rate is 12 rupees per 100 pounds higher and is effective as of November 1, 1948.

Interest in the plastics industry is growing in India. Recently a mission representing Indian plastics manufacturers came to the United States to study the American industry; plants in Canada and England were next visited, and it was planned also to visit Germany, France, Czechoslovakia, and Switzerland. It was revealed that India intends to spend about $10,000,000 by 1953 to expand the industry and is anxious to extend its export trade beyond the present markets in the Middle East, Burma, and Malaya. It seems that a scheme to double the present output is being considered by the government; it is proposed to increase the output of phenol-formaldehyde molding powders to meet the full demands of the industry. At the same time there is to be a temporary reduction of the import duty of such plastics as are not likely to be produced in India in the near future, including polystyrene, polymethylmethacrylate, and polyvinyl chloride.

According to official figures, about 40 firms in India treat plastics, they do molding and turn out electrical accessories, utility articles, bottle caps, and fancy goods, following chiefly the compression molding method.

EUROPE

GREAT BRITAIN

IRI Considers Pertinent Questions on Rubber

A number of questions arising from the International Rubber Conference held in June, 1948, were considered at the first meeting of the 1948-49 season of the London Section of the Institution of the Rubber Industry. Among the questions were: Is the study of the oxidation of raw rubber worth while? Are the complex theories of elasticity being developed by Mr. Rivlin of any value to the practical rubber technologist? What is the effect of sodium pentachlorphenate on the lutoid fraction in latex? How does the lutoid fraction affect vulcanization? Can stearic acid compensate such effects? Does kinetic analysis of rubber halides give hope of preparing a vulcanizable chlorinated derivative of rubber? Does any work on rubber derivative make such a product a likely outcome? Is the free retraction of stretched rubber a wave mechanism, or a uniform retraction throughout? How will a wave mechanism affect, say, a vibrating impulse applied to the rubber. Are there any methods of stopping the action of a creaming agent?

Regarding the vulcanizability of chlorinated rubber, Dr. Pickles stated that the work described by Dr. Salomon and colleagues at the June Conference held out hope of rendering chlorinated rubber sufficiently unsaturated to become vulcanizable, but he thought the question was one for practical trial rather than theoretical discussion. He referred to a British patent for vulcanizable chlorinated rubber (No. 487,168, Baxter, Habgood, and I.C.I., Ltd.).

G. Martin revealed he was taking out a patent for chlorinated or brominated rubber made from latex which was vulcanizable. Questions by G. Newton as to the resilience of vulcanized chlorrubber and by G. L. Hammond as to what occurred when fluorine reacted on chlorinated rubber could not be answered. The chairman reminded the meeting of the butadiene-chlorstyrene copolymers which vulcanized to better products than GR-S and were, in effect, vulcanizable chlorinated rubbers.

Rubber Technology Lectures

Members of the staff of the British Rubber Producers' Research Association are giving a series of lectures this winter in the Applied Science Section (which includes rubber technology) of the Newton Heath Municipal Technology School, Manchester. The program follows:

November 18. "Oxidation and Scission in Polyisoprenes," by J. L. Bolland.

December 2. "Decomposition Reactions of Organic Peroxides," by C. G. Moore.

December 16. "The Physical Basis of Rubber Elasticity," L. R. G. Treloar.

January 20, 1949. "An Approach to the Design of Engineering Components in Rubber," D. W. Saunders.

February 3. "Dynamic Properties of Vulcanized Rubbers," W. P. Fletcher.

February 17. "Some Thermodynamic Properties of Rubber," G. Gee.

British Rubber Industry Notes

The well-known rubber technologist, Fritz Frank, chief consultant to Franks Laboratories, Ltd., London, celebrated his eightieth birthday on September 27, 1948. Dr. Frank came to England from Germany in 1938 when he helped to found the laboratories that bear his name. In Germany, Dr. Frank had been a professor at the Technical University of Berlin-Charlottenburg and had also at one time been associated with E Marckwald in the Dr. Rob. Henriques Rubber Laboratories.

George Spencer, Moulton & Co., Ltd., Bradford-on-Avon, recently celebrated 100 years of existence as a manufacturer of rubber goods. A large number of guests participated in the festivities and each one received a copy of an illustrated brochure, "A Hundred Years of Rubber Manufacturing," compiled by S. S. Pickles. The firm was started in 1848 by Stephen Moulton to manufacture rubber goods. Ten years later business contacts were made with George Spencer & Co. of London, and the two firms worked together until 1891 when they were merged in the present concern.

Maurice F. Coop has been appointed secretary of Dunlop Rubber Co., Ltd., following the retirement of the former secretary, Sir Charles Tennyson.

Dunlop has opened a style and design center in Leicester with the aim of extending export markets for casual footwear. The new center will be under the management of A. R. Knight, Dunlop's regional footwear manager in London.

The new plant of British Geon, Ltd., Barry, South Wales, commenced operations some months ago, the parent company, Distillers Co., Ltd., revealed at a recent meeting. The plant produces the Geon brand of polyvinyl chloride.

The Palatine Development Co., which is to manufacture carbon black by the process of the Phillips Petroleum Co., of Oklahoma, U.S.A., has changed its name to Philblack, Ltd. Arrangements have been made for new capital, and a plant is to be erected at Avonmouth to produce 20,000,000 pounds of Philblack "A" and 30,000,000 pounds of Philblack "O" annually. The plant is expected to be ready by 1950.

DC SILICONES

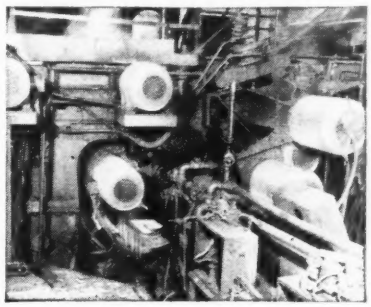
Silicone News

New Muscles for Motors

Ordinary motors refuse to be overworked. If a job is too tough, they quit and your machinery stands idle until a new motor is installed. Your only alternative to frequent motor failure used to be the installation of larger motors even though it might involve costly redesigning of the machine or the whole installation.

PHOTO COURTESY CARNEGIE-ILLINOIS STEEL CORPORATION

Silicone insulated motors still in service after 14 months of exposure to water, steam, high ambients and heavy overloads in steel mill strip coilers.



Now, there is an easier and far less expensive alternative. You can give your motors much greater overload capacity by having them rewound with Silicone Insulation. Here's an example from the Gary, Indiana plant of Carnegie-Illinois Steel Corporation. Coilers, driven by 7 motors, take red-hot steel strip from an 80 inch mill and roll it into coils while the strip is cooled with water.

These motors are exposed to water, steam, high ambient temperatures and overloads. After several failures, the bottom-most motors, which carry more than their share of the 12,000 pound load, were rewound with Dow Corning Silicone Insulation. Average life of Class B motors in those spots was 2 months. The silicone insulated motors were still in service after 14 months.

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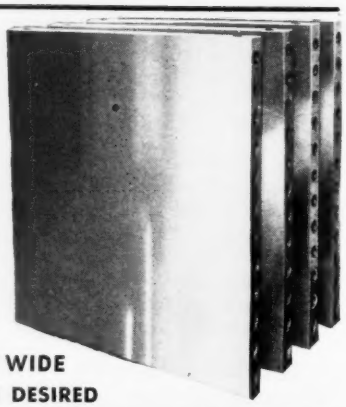

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Editor's Book Table

BOOK REVIEWS

"Fatty Acids and Their Derivatives." A. W. Ralston. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Cloth, 5½ by 8½ inches, 992 pages. Price $10.

This volume is an excellent presentation of data on fatty acids and their derivatives, and its size reflects the great strides taken in this field during the past two decades. The subject matter is divided into two logical sections. The first section, comprising five chapters, covers the fatty acids, their occurrence in nature, their synthesis, and their physical properties. The second section, consisting of six chapters, covers the synthesis, properties, and uses of the different fatty acid derivatives and includes much material brought together and discussed for the first time. Charts, tables, and chemical structural diagrams are used to illustrate the text, and more than 5,000 literature references are presented chronologically at the end of the chapters. A chapter on recent work in the field and an exhaustive subject index of 42 pages round out this particularly valuable treatise.

"Distillation and Rectification." Emil Kirschbaum. Translated by M. Wulfinghoff. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Cloth, 5½ by 8½ inches, 436 pages. Price $10.

A recent translation of a German book originally published in 1940, this volume gives a comprehensive coverage of important developments in the field of distillation and rectification. Since the most recent work covered in the text is in the 1935-1939 period, the translator has added a supplementary section of 15 pages on later developments. This section unfortunately consists only of brief abstracts of work published between 1941 and 1946 and does not eliminate the need of a more modern and up-to-date treatment of the subject.

The book is comprehensive in its treatment of the subject matter up to about 1936, with major emphasis placed on theory and calculations. Graphical methods are stressed, and coverage is excellent as of the date noted. Some irritation will arise from the excessive use of Greek letters and unconventional symbols; the somewhat inadequate referencing and indexing; the use of letter sections and numerical subsections instead of chapters; and the lack of page headings to indicate the section.

"Chemical Process Principles." Olaf A. Hougen and Kenneth M. Watson. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Cloth, 6 by 9 inches, 1152 pages. Price $12.50.

This is the combined volume and includes the earlier Part I "Material and Energy Balances," originally published in 1943, in addition to the new Part II "Thermodynamics" and Part III "Kinetics and Catalysis." The three parts, which are also available in separate volumes, are essentially one, although the progressive inclusion of higher mathematics makes the latter part more suitable for graduate students and practicing engineers.

Part I, comprising 10 chapters, covers the general chemical engineering principles, including ideal gases, vapor pressures, solubility, material balances, thermophysics, thermochemistry, and similar topics. Part II consists of seven chapters and discusses the thermodynamic problems of the chemical process industries, with emphasis on practical methods for process design. Part III, consisting of five chapters, covers chemical kinetics as applied to reactor design for homogeneous, heterogeneous, and catalytic reactions, with special attention to the interpretation of pilot-plant data. The obvious value of the book is further enhanced by the use of excellent charts and a clear presentation and the inclusion of problems at the end of each chapter, a complete list of symbols, a lengthy bibliography, and comprehensive author and subject indices.

NEW PUBLICATIONS

"Resorcinol." Bulletin No. C-8-124, October 27, 1948. Koppers Co., Inc., Pittsburgh 19, Pa. 16 pages. This technical bulletin gives information on the chemistry and applications of resorcinol, the grades made by Koppers, and its handling and storage.

"Indonex Plasticizers in Butyl Mechanical Goods." Circular No. 13-30, December 10, 1948. Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill. 8 pages. Formulations and extensive laboratory test data are given in this report on the use of Indonex Plasticizer 638½ in different Butyl stocks containing Thermax, Philblack A, and SRF black. These relatively low-cost formulations are shown to be satisfactory for various mechanical goods.

A supplementary letter, dated January 1, mentions satisfactory results obtained with Butyl reclaim in reducing cost of certain mechanical goods formulations and suggests use of low-cost Butyl scrap in certain die-cut products.

"Indonex Plasticizers in Neoprene Compounds." Circular No. 13-31, December 15, 1948. 4 pages. This bulletin presents formulations and test results obtained by using Indonex plasticizer in neoprene compounds for special and heavy-duty service. Use of up to 25% Indonex shows no evidence of incompatibility and indicates possible volume cost reduction of about 15% in addition to slowing down the cure, decreasing the modulus and hardness, and increasing the elongation.

"Phillips 66 Hydrocarbons." Third Edition. Phillips Petroleum Co., Bartlesville, Okla. 160 pages. This catalog gives information on specifications, impurities, typical properties, and containers on the individual grades of the company's paraffins, cycloparaffins, olefins, cycloolefins, diolefins, and aromatics. A section on technical data covering test methods, conversion tables, and container information is also included.

Publications of the British Rubber Producers' Research Association, 48 Tewin Rd., Welwyn Garden City, Herts., England. **"The Interaction between Rubber and Liquids. Part X.** Some New Experimental Tests of a Statistical Thermodynamic Theory of Rubber-Liquid Systems." Geoffrey Gee. Publication No. 99. 12 pages. The swelling of rubber in a solvent depends on the nature of the solvent and the degree of vulcanization of the rubber. The paper shows that existing theories account only partially for the experimental observations on the swelling equilibrium under various conditions of temperature and extension of the rubber.

"The Hydrodynamics of Non-Newtonian Fluids. Part I." R. S. Rivlin. Publication No. 100. 22 pages. A new approach to the problem of fluid flow is developed mathematically and applied to a number of particular problems. The theory predicts the existence of stresses in the fluid not obtained by the ordinary elementary theory of viscous flow. Some of these stresses have been observed experimentally. The theory appears to have applications to rubber and rubber solutions and may provide an approach to the interpretation of their visco-elastic properties.

"Darex Copolymer X43." Technical Bulletin C-3, November, 1948. Dewey & Almy Chemical Co., Cambridge 40, Mass. 12 pages. This report gives the properties of Darex Copolymer X43, formulations and results obtained by its use in GR-S, natural rubber, and GR-S-natural rubber blends, commercial applications, and detailed processing instructions.

Publications of American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. **"Symposium on Usefulness and Limitations of Samples."** Paper, 6 by 9 inches, 42 pages. Price $1. This booklet includes the following papers, with their discussions, presented at the Society's June 22, 1948, meeting in Detroit, Mich.: "Sampling and Its Uncertainties," S. S. Wilks, Princeton University; "On Variation in Materials, Testing, and Sample Sizes," L. E. Simon, Aberdeen Proving Grounds; and "The Amount of Inspection as a Function of Control of Quality," G. R. Gause, Bell Telephone Laboratories.

"A.S.T.M. Standards on Paper and Paper Products, With Related Information." Paper, 6 by 9 inches, 284 pages. Price $2.50. This fourth edition (December, 1948) of this publication contains the 77 specifications and test methods on paper and paper products developed by the Society's committees, particularly Committee D-6 and also contains many standards on electrical insulating materials employing paper or its products.

"Everywhere in Industry It's Hycar American Rubber." B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. 16 pages. This illustrated booklet includes sections on compounding and properties of Hycars; effect of aging; Ebonar; Hycar cements; Hycarphenolic blends; immersion data, properties, and processing of Hycar latices; Geon Polyblend; and processing and properties of Good-rite Resin 50.

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"Yarway News." Vol. 4, No. 1. Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa. 8 pages. This issue of the company publication gives a brief review of the origin and development of Yarnall-Waring started in 1908, and describes and illustrates the company's different products.

"Surface Activity and Detergency." Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y. 8 pages. This leaflet describes the activities of the company and available consulting and research services in the field of surface activity and detergency.

"Rubber Developments." Vol. 1, No. 6, December, 1948. British Rubber Development Board, Market Bldg., Mark Lane, London E.C.3, England. 36 pages. This issue contains the following articles in addition to other news items on rubber: "Powdered Rubber," T. R. Dawson; "Latex Processes and Potentialities. 6. Latex Thread," W. H. Stevens; "The Outlook for Foamed Latex," P. P. Crisp; "Tires. 2. Pneumatic Tires for Off-The-Road Use," L. A. Mernagh; "Rubber Paste and Its Uses," L. C. Bateman; and "Rubber Adhesives in Industry," L. E. Puddefoot.

"Summarized History of the Operations of Rubber Development Corporation and Its Predecessor, Rubber Reserve Company, in the Procurement and Development of Natural Rubber during the Period of the Inter-American Rubber Agreements, April 1, 1942, to June 3., 1947." Douglas H. Allen and Francis A. Truslow. Douglas H. Allen, 222 Eleventh Ave., New York 1, N. Y. 20 pages. This booklet describes the development, procurement, and production of wild rubber from Central and South America under the Inter-American Rubber Agreements. Among the points noted is the fact that the average cost to this country of wild rubber from Latin America was approximately 59¢ a pound.

"Guidance in the Manufacture and Uses of Synthetic Resins, Polymers, and Their Plastic Products." DeBell & Richardson, Inc., Hazardville, Conn. 18 pages. This illustrated booklet discusss the function of the consulting engineer and then describes the company's services and facilities.

"The Waste Trades Annual and Directory." Edited by Gordon Hughes. British Continental Trade Press, Ltd., 225 W. 34th St., New York 1, N. Y. Cloth, 8½ by 5½ inches, 346 pages. Price $5. This book is primarily a directory and yearbook of the British waste materials industry, although there is also some coverage of the industry in other countries, including the United States. The first portion of the book contains articles on the various British scrap materials industry, including an article on "Reclaimed Rubber" by S. C. Lewis, Rubber Improvement, Ltd. Among the topics covered by succeeding chapters are world scrap materials organizations and trade associations; scrap supplies in Germany; British regulations on control of trade and prices of waste materials; world directory of scrap dealers; and a buyers' guide.

"100 Million Motor Vehicles." 40 pages. **"Automobile Facts and Figures."** Twenty-Eighth Edition, 1948. 80 pages. Automobile Manufacturers Association, Detroit 2, Mich. **"Memorandum of Increased Rates and Charges."** November 15, 1948. Union Pacific Railroad Co., Omaha, Neb. 64 pages. **"Engineering Data on Rubber Grommets, Bumpers, Rings, Bushings, Gaskets, Suction Cups, Special Parts, and Extrusions."** Miller Products Co., Inc., New York 7, N. Y. 4 pages. Publications of Underwriters' Laboratories, Inc., Chicago 11, Ill.: **"A Reprint of Two Recent Studies of Ammonium Nitrate by Bureau of of Mines, U. S. Department of the Interior."** Supplement to Bulletin of Research, No. 39. Subject 192. October, 1948. 56 pages. **"The Life Hazards and Nature of the Products Formed When Chlorobromethane Extinguisher Liquid Is Applied to Fires."** Bulletin of Research, No. 42. August, 1948. 60 pages. **"Bi-Monthly Supplement to All Lists of Inspected Appliances, Equipment, Materials."** October, 1948. 80 pages. **"Capital Formation under Free Enterprise."** National Association of Manufacturers, New York 20, N. Y. 88 pages. **"1949 Directory of Occupational Safety Posters."** National Safety Council, Chicago 6, Ill. 76 pages. **"Controlled Humidification with Armstrong Steam Humidifiers."** Armstrong Machine Works, Three Rivers, Mich. 12 pages. **"1949 Year Book. Airplane Section."** The Tire & Rim Association, Inc., Akron 8, O. 38 pages. Price, $0.75. **"More Horsepower per Dollar with Speedaire."** Cleveland Worm & Gear Co., Cleveland 4, O. 8 pages.

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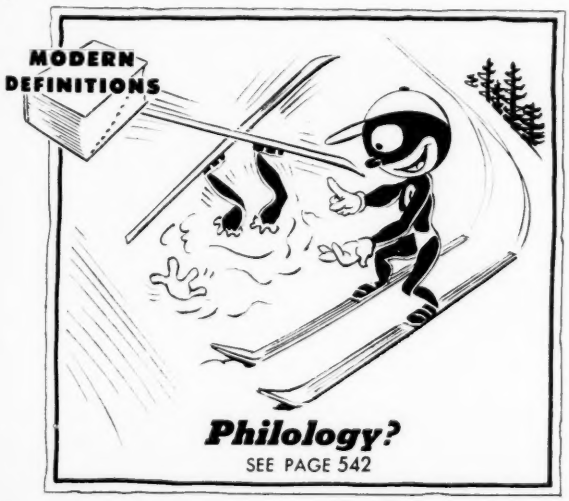

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Market Reviews

CRUDE RUBBER

New York Outside Market

WEEK-END CLOSING PRICES

	Nov. 27	Dec. 31	Jan. 8	Jan. 15	Jan. 22	Jan. 29
No. 1 R.S.S.:						
Jan.	18.75	18.88	19.25	19.25	19.25	19.13
Feb.-Mar.	18.75	18.88	19.25	19.25	19.13	19.13
Apr.-June	18.63	18.63	19.13	19.13	19.00	19.00
July-Sept.	18.50	18.50	19.00	19.00	18.88	18.88
No. 3 R.S.S.	18.00	17.88	18.25	18.13	18.13	18.13
No. 2 Br.	14.25	15.00	15.25	15.00	15.25	15.00
Flat Bark	11.50	12.25	12.25	12.00	12.13	12.13

THE New York Outside Market went through another month of listless trading during January, with manufacturers continuing their policy of buying only to fill immediate needs. In the footwear field manufacturers are well stocked with inventories because of the unseasonably warm weather in the eastern part of the country. Footwear manufacturers, in general, were reducing production because of reduced sales. While tire producers' stocks are reported low, no effort was made to build up inventories in view of the steadily incoming shipments of crude rubber.

Price movements in the Outside Market followed those evident in the Commodity Exchange. The spot price for No. 1 R.S.S. began the month at 19.13c, reached a high of 19.75c on January 10 and 11, then fell irregularly downward to close the month at 19.25c. As in preceding months, lower-quality stocks showed only limited price movement: No. 3 R.S.S. moved in the 18.00-18.50c range; No. 2 Brown hovered between 15.00-15.50c; and Flat Bark was priced in the 12.00-12.50c range.

Commodity Exchange

WEEK-END CLOSING PRICES

	Nov. 27	Dec 31	Jan. 8	Jan. 15	Jan. 22	Jan. 29
Standard Contract:						
Mar.	18.40	18.40	19.00	18.85	19.03	19.00
May	18.30	18.25	18.80	18.65	18.80	18.80
July	18.20	18.15	18.70	18.55	18.65	
Sept.	18.10	18.05	18.60	18.45	18.45	
Nov.	18.00	17.95	18.50	18.35	18.35	
1950						
Jan.	17.90	17.85	18.40	18.25	18.25	
Weekly sales volume, tons.	1,410	210	270	90	40	420
No. 1 Contract:						
Mar.	18.60	18.80	19.25	19.15	19.35	19.20
May	18.40	18.65	19.00	18.91	19.05	18.95
July	18.20	18.50	18.85	18.65	18.80	18.65
Sept.	18.15	18.35	18.60	18.50	18.55	18.45
Nov.	18.05	18.25	18.47	18.37	18.42	18.32
1950						
Jan.	17.95	18.15	18.35	18.25	18.30	18.20
Weekly sales volume, tons	1,970	1,790	2,450	3,510	3,240	1,900
Total sales volume, tons.	3,380	2,000	2,720	3,600	3,280	2,320

RUBBER futures trading on the Commodity Exchange was rather dull throughout most of January. After a slow start, activity picked up in the second week of the month, and prices rose with reports of further government stockpile purchases, Chinese speculative buying in the Far East, and news that shipments of sheet and crepe from Malaya during December declined to their lowest level in a year and a half. From a level of more than 94,000 tons in November, December Malayan exports dropped to 63,737 tons, of which 20,691 tons went to the United States, 6,763 tons to the United Kingdom, and 5,320 tons to Russia. It was said that the Chinese interest stemmed from a desire of the nationalist government to convert cash into commodities.

After this burst of activity the market again lapsed into listlessness, and prices fell off somewhat during the remainder of January. In general, market undertones were stable, reflecting the firmness of foreign markets. March futures in the No. 1 contract opened the month at 19.05c, reached a peak of 19.60c on January 10, then declined, fluctuated irregularly, and closed the month at 19.30c. Other futures prices in the No. 1 contract showed corresponding movement. In the standard contract January futures sold at 19.10c on January 3, reached a high of 19.45c on January 10 and 11, and closed at 19.10c.

Volume of futures trading was only moderate during January, with 12,620 tons sold, as compared with 19,270 tons sold during December. Of the January volume total, 11,800 tons were in the No. 1 contract and 820 tons in the standard contract. Recognizing the fact that trading in the old standard contract has been largely supplanted by trading in the No. 1 contract, the Exchange's board of governors announced on January 21 that trading in the standard contract would be discontinued on May 27, and that until that date trading would be permitted only in the intervening delivery months.

Latices

THE drop in price of top-quality *Hevea* latex during late December to 25.50-29.75c a pound, the lowest level in more than eight years, has not as yet apparently encouraged large-tonnage conversions from GR-S latex, according to Arthur Nolan, Latex Distributors, Inc., writing in Lockwood's January *Rubber Report*. The price reduction, however, is seen as promoting greater use in foam cushioning applications. The major cause for the price decline was obviously the low current price of Ribbed Smoked Sheet, but contributing factors were the competitive lower price advantage of GR-S latices and the oversupplied position of *Hevea* latex.

Mr. Nolan gives *Hevea* latex imports for November as 813 long tons, dry weight; consumption, 2,487 long tons; and month-end stocks, 9,540 long tons. November GR-S latex production is given as 1,814 long tons, dry weight. It is noted that the 9,540 long-ton figure for *Hevea* latex stocks at the end of November appears incorrect and shows a discrepancy of 1,212 tons from totals computed from October figures.

Increasing inroads in the fields of application of rubber latices are being made by plastic latices, particularly the vinyl, polystyrene, and nitrile-rubber mixture types, Mr. Nolan states. Despite their high initial cost per pound, the plastic latices are no longer being confined to "specialty" uses. In view of their processing and control advantages over rubber latices, continued wider use of the plastic latices at rubber's expense is foreseen.

SCRAP RUBBER

THE domestic scrap rubber market showed a slight improvement in activity during January after the year-end lull. Volume of business was still on a low tonnage basis but, the market was strengthened by increased export trading. Inquiries from abroad, principally from Spain and Germany, were noted, and Japan is also expected to enter the market shortly. Export trading still involves many problems such as lack of dollar credits and inability to secure licenses. It is reported that much of the trade with Spain depends on reciprocal business; while German trade involves deals through JEIA for the most part.

Only two price changes took place last month. Black passenger tubes dropped from 4.25c to 4.00c both in Akron and the East, and black truck tubes declined from 4.00c to 3.75c at both points.

Following are dealers' buying prices for scrap rubber, in carload lots, delivered to mills at points indicated:

	Eastern Points (Per Net Ton)	Akron, O.
Mixed auto tires	$11.50	$13.00
S-A, G passenger (natural)	nom.	nom.
Truck (natural)	nom.	nom.
Peelings (natural), No. 1	50.00	50.00
2	31.00	31.00
3	29.00	29.00
	(¢ per Lb.)	
Mixed auto tubes	3.50	3.50
Red passenger tubes	7.00	7.25
Black passenger tubes	4.00	4.00
Truck tubes	3.75	3.75
Mixed puncture-proof tubes	0.50	0.50
Air brake hose	nom.	nom.

RECLAIMED RUBBER

SALES of reclaimed rubber during January showed a pick-up after the December decline and approached the November level of more than 22,000 long tons. Production remained at high levels, and the industry in general looks forward to another good year of business. Total rubber consumption is expected to be high in 1949, and reclaim will probably take its share of the market. A stable market for reclaim is expected to exist in passenger-tire carcass stocks and automotive hard-rubber battery containers, although the low natural rubber price has and will affect the use of reclaim in many molded and industrial goods.

Final October and preliminary November statistics on the domestic reclaimed rubber industry are now available. Production of reclaim during October totaled 23,859 long tons; consumption, 23,512 long tons; exports, 848 long tons; and month-end stocks, 31,879 long tons. Preliminary figures for November show a production of 22,809 long tons; consumption, 22,144 long tons; exports, 800 long tons; and end-of-month stocks, 33,530 long tons.

There were no changes in reclaimed rubber prices last month, and current prices are listed below:

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8.5 / 9
Peel	1.18-1.20	8.5 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.75
Red	1.20-1.22	14 /14.5
GR-S	1.18-1.20	9.5 /10
Butyl	1.16-1.18	8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all

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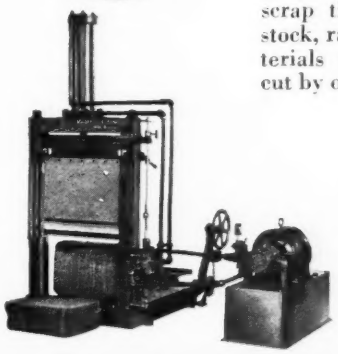

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cerivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

RAYON

RAYON industry forecasts for 1949 point to price levels for gray and finished goods below those which prevailed in 1948. The physical consumption potential for rayon textiles during 1949 appears to be more favorable than the current distressed price structure in finished goods would seem to warrant, and production of rayon textiles will probably be maintained at high levels this year.

The trend toward a heavier average denier viscose high-tenacity rayon yarn, such as is used in tires, continues. The average denier was 987 in April, 1944, is 1475 at present, and is expected to reach 1500 by March, 1950. The 1100-denier yarn, which comprised 87% of the total high-tenacity yarn capacity in April, 1944, has now declined to 29% of the current total and by March, 1950, will have declined to 25%. The 1650-denier, however, has become the principal high-tenacity yarn and by 1950 is expected to account for 64% of the total production of this type of yarn. High-tenacity yarns in the 2200-denier range currently constitute 10% of total capacity and are expected to reach 13% by March, 1950. High-tenacity yarn output will remain relatively stable after July, when an annual capacity of 282,000,000 pounds will have been attained. The current output rate is 277,000,000 pounds, a level reached sooner than originally expected.

No changes in rayon tire yarn and fabric prices occurred during January, and current prices are listed below:

Rayon Fabrics

Tire Yarns		
1100/480	$0.55	/ $0.56
1100/490	.57	
1150/490	.57	
1650/720	.54	/ .56
1650/980	.56	
1900/980	.56	
2200/960	.55	
2200/980	.55	
Tire Fabrics:		
1100/490/2	.71	
1650/980/2	.685	/ .70
2200/980/2	.67	

COTTON AND FABRICS

New York Cotton Exchange Week-End Closing Prices

	Nov. 27	Dec. 31	Jan. 8	Jan. 15	Jan. 22	Jan. 29
Mar.	31.84	32.33	32.20	32.40	32.73	32.69
May	31.63	32.13	32.00	32.18	32.49	32.46
July	30.77	31.10	31.00	31.10	31.36	31.37
Oct.	28.59	28.58	28.40	28.54	28.61	28.72
Dec.	28.39	28.43	28.20	28.35	28.39	28.49
1950						
Mar.	28.16	28.22	28.10	28.24	28.27	28.36

THE cotton market during January on the New York Cotton Exchange showed renewed activity as prices rose strongly. Major factors influencing this price rise appeared to be heavy export demand, a strong covering movement by speculative interests, and mill buying at a more active level than in the past few months. Some nervousness became evident late in the month, and speculative realizing operations braked the price rise. Foreign demand also tapered off toward the end of January and caused a weak market, leading some observers to assert that exports were the main supports for the upswing in prices. These observers contend that with exports lacking the cotton market is in a dangerous, technically overbought condition.

Spot prices for 15/16-inch middling cotton opened at the monthly low of 32.88¢ on January 3, rose fairly regularly to a high of 33.91¢ on January 24, and closed the month at 33.70¢. May futures prices showed similar movement, being 31.94¢ on January 3, reaching a high of 32.60¢ on January 24, and closing at 32.51¢ on January 31.

Cotton consumption last year totaled 9,354,000 bales, as compared with the record total of 11,170,000 bales in 1941-42. Year-end stocks are estimated at 12,646,000 bales, of which the government holds about 31% or 3,950,000 bales.

Fabrics

The wide industrial cotton gray goods market continued its dull trend during January. Most purchases were in the spot and nearby delivery categories, thus shifting the stock carrying burden back to the mills. Plenty of February deliveries were said to be unassigned in duck, chafer fabric, hose, and belting constructions, but other goods such as sateens, headlinings, and awning ducks were moving briskly.

A few March orders were booked in sateens for the coating trade, with the 58-inch 1.20-yard construction selling at 72.50-72.63¢. Wide drills sold moderately, with the 1.85-yard fabric priced at 37.50-38¢. The automobile trade continued to buy headlinings through the first quarter, and no signs of slowing down were apparent. Hose and belting ducks, somewhat quieter than in recent months, were quoted at 69.50¢; while wide ducks were only moderately active beyond the nearby period. It was noted that chafers were bought in fair amounts by the rubber trade only through February, continuing the tire industry's hand-to-mouth purchasing policy.

TRADE MARKS

(Continued from page 648)

441,708. Representation of a woman's head and the words: **"Cannon Beautettes."** Footwear. Cannon Shoe Co., Baltimore, Md.

441,719. **GlacitE.** Plastic material in sheet, rod, and tube form. Plastic Glass Corp., Brooklyn, N. Y.

441,720. Representation of two chevrons and the words: **"Safety Legion."** Rainwear. Winner, Inc., Berne, Ind.

441,722. **Zylar.** Zinc calcium resinate used in coating and plastic compositions. Newport Industries, Inc., Pensacola, Fla.

441,735. Representation of a mace between the words: **"Palter DeLiso."** Footwear. Palter De Liso, Inc., New York, N. Y.

441,738. Representation of a circle containing the words: **"Zimmerman Packing Co."** and an inner circle containing the letter **"Z."** Packing. C. H. Zimmerman, doing business as Zimmerman Packing Co., Cincinnati, O.

504,158. **Aromex.** Carbon black. J. M. Huber Corp., Red Bank, N. J.

504,167. **Ken.** Rubber grips for golf club shafts, etc. K. Smith, Kansas City, Mo.

504,169. Representation of an oval containing two curved arrows and the words: **"Gro Cork."** Foot wear. Grow-Cord Rubber Co., Lima, O.

504,173. **J5V.** Footballs. A. G. Spalding & Bros., Inc., Chicopee, Mass.

504,181. **WD.** Golf balls. A. G. Spalding & Bros., Inc., Chicopee, Mass.

504,182. **Olympic.** Golf balls. A. G. Spalding & Bros., Inc., Chicopee, Mass.

504,214. **Detaché.** Foundation garments. Perfette Corsets, Inc., New York, N. Y.

504,263. **Tru-Flate.** Tire air gages and parts. Druge Brothers Mfg. Co., Oakland, Calif.

504,280. **Bail-O-Matic.** Water removal suction tube. Transco Products, Inc., Los Angeles, Calif.

504,296. **Goodyear.** Tires. Goodyear Tire & Rubber Co., Akron, O.

504,343. **Armourite.** Coated abrasive products. Armour & Co., Chicago, Ill.

504,349. **Manhattan.** Belting, hose, etc. Raybestos-Manhattan, Inc., Passaic, N. J.

504,355. **Nuflex.** Elastic webbing. Narrow Fabric Co., West Reading, Pa.

504,375. **Lee of Conshohocken.** Cement. Lee Rubber & Tire Corp., Conshohocken, Pa.

504,387. **Timbond.** Blood resin adhesive compositions. Armour & Co., Chicago, Ill.

504,398. **Handi Kurl.** Combs. Vulcanized Rubber & Plastics Co., New York, N. Y.

504,399. **Sealect.** Combs. Vulcanized Rubber & Plastics Co., New York, N. Y.

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, and Inventory, November-October, 1948; First 11 Months, 1948-1947

	1948				1947,
	November	% of Change from Preceding Month	October	First 11 Months	First 11 Months
Passenger Casings					
Shipments					
Original equipment	1,946,041		2,043,467	19,685,245	17,725,525
Replacement	2,506,140		3,175,434	38,923,705	49,531,511
Export	50,519		56,604	587,397	1,516,757
Total	4,502,700	—14.65	5,275,505	59,196,347	68,773,793
Production	4,980,269	—10.43	5,560,088	62,170,458	71,172,006
Inventory end of month	8,515,885	+ 6.42	8,002,433	8,515,885	4,011,831
Truck and Bus Casings					
Shipments					
Original equipment	389,259		392,716	4,855,755	4,992,578
Replacement	632,402		723,868	7,249,826	9,311,659
Export	67,424		99,437	1,030,228	1,523,807
Total	1,089,085	—10.44	1,216,021	13,135,809	15,828,044
Production	1,118,181	— 6.05	1,190,212	13,482,621	16,328,230
Inventory end of month	1,960,266	+ 3.02	1,902,830	1,960,266	1,265,373
Total Automotive Casings					
Shipments					
Original equipment	2,335,300		2,436,183	24,541,000	22,718,103
Replacement	3,138,542		3,899,302	46,173,531	58,843,170
Export	117,943		156,041	1,617,625	3,040,564
Total	5,591,785	—13.86	6,491,526	72,332,156	84,601,837
Production	6,098,450	— 9.66	6,750,300	75,653,079	87,500,236
Inventory end of month	10,476,151	+ 5.76	9,905,263	10,476,151	5,277,204
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	2,343,900		2,432,152	24,548,663	22,711,241
Replacement	2,693,681		3,537,048	38,185,498	43,749,711
Export	85,856		91,316	1,000,872	2,365,661
Total	5,123,437	—15.46	6,060,516	63,735,033	68,826,613
Production	5,463,453	—13.60	6,323,006	65,115,963	72,635,775
Inventory end of month	9,303,066	+ 4.35	8,915,443	9,303,066	6,682,871

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers' Association, Inc., 444 Madison Ave., New York 22, N. Y.

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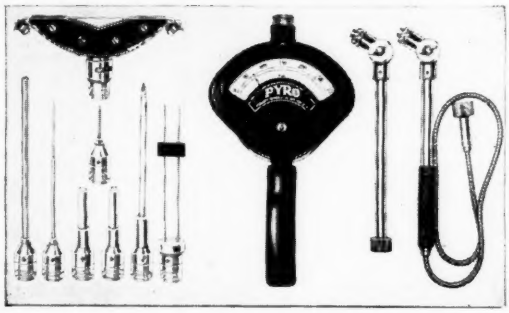

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Malayan Rubber Statistics

The following statistics for November, 1948, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W. C. 2, England.

Ocean Shipments from Singapore and Malayan Union—In Tons

	Sheet and Crepe			Latex, Concentrated Latex, and Revertex (Dry Rubber Content)		
		Malayan Union			Malayan Union	
To	Singapore Export Proper	Trans-shipped	Direct Shipments	Singapore Export Proper	Trans-shipped	Direct Shipments
Argentine Republic	2	22			19	
Australia	1,465	90	358	31	66	
Belgium	334	159	480	19	9	
Canada	1,754	158	1,505			
Chile	224					
China	945	25	241			
Cyprus	4					
Denmark	31	52	46			5
Egypt	8			1	8	
Finland	60	300	349	2	3	
Formosa	262					
France	1,756	336	2,089	211	34	8
Germany	3,487	1,586	3,653	138	129	7
Hong Kong	1,010	30	251			
Iraq	8					
Italy	822	304	474		96	
Japan	1,001	227	1,437	103		
Mauritius	1					
Mexico	308	15	731			
Netherlands	387	54	200	3	1	3
New Zealand	198		110	10	27	1
Norway	205	50		6	11	
Other countries in South America	151		275			
Pakistan	7					
Poland			492			
Portugal	62		403			
Rumania	203		200			
Russia	4,432		5,897			
Spain	275		304			
Sumatra			4			
Sweden	665	185	684	29		
Switzerland	30		30			
Syria	5			2		
Turkey	110	40	115			
Union of India	201		100			
Union of South Africa	562	80	289	8	10	2
United Kingdom	4,688	2,345	6,704	729	35	27
U. S. A.	14,446	2,313	14,856	816		1,142
TOTAL	40,109	8,371	42,277	2,108	448	1,195

Foreign Imports of Rubber in Long Tons

	Dry Rubber	Wet Rubber (Dry Weight)
Singapore Imports from		
Banka and Billiton	274	25
Brunei	156	2
Durth Borneo	870	1,457
Java	22	
North Borneo	1,013	60
Other Dutch Islands	36	1
Rhio Residency	574	58
Sarawak	1,698	34
Sumatra	*5,354	6,493
TOTAL	9,997	8,130

*Includes 6 tons sole crepe.

Federation of Malaya Imports from	
Burma	262
Siam	2,175
Sumatra	1,248
TOTAL	3,685

Dealers' Stocks	Tons
Penang and Province Wellesley	9,519
Singapore	42,388
TOTAL	51,907

Port Stocks in Private Lighters and Railway Godowns	
Penang & Province Wellesley	6,531
Port Dickson	170
Port Swettenham	1,120
Singapore	7,401
Teluk Anson	344
TOTAL	15,556

Production	
Estates	34,149
Small holdings (estimated)	27,822
TOTAL	61,971

Dividends Declared

COMPANY	STOCK	RATE	PAYABLE	STOCK OF RECORD
Baldwin Rubber Co.	Com.	$0.15 q.	Jan. 25	Jan. 14
	Com.	0.05 extra	Jan. 25	Jan. 14
Boston Woven Hose & Rubber Co.	Com.	0.50	Feb. 25	Feb. 15
Crown Cork & Seal Co., Ltd.	Com.	0.50 q.	Feb. 15	Jan. 14
Dayton Rubber Co.	Com.	0.30 q.	Jan. 25	Jan. 10
	"A"	0.50 q.	Jan. 25	Jan. 10
Firestone Tire & Rubber Co.	4½% C. Pfd.	1.12½ q.	Mar. 3	Feb. 15
General Cable Corp.	1st Pfd.	1.00 q.	Jan. 3	Dec. 29
	2nd Pfd.	0.50 q.	Jan. 3	Dec. 29
General Tire & Rubber Co.	Com.	1.00 extra	Jan. 20	Jan. 10
Goodall Rubber Co.	Com.	10% stock	Dec. 30	Dec. 16
	Com.	0.15	Feb. 15	Feb. 1
Goodyear Tire & Rubber Co.	Com.	1.00 q.	Mar. 15	Feb. 15
	$5 Pfd.	1.25 q.	Mar. 15	Feb. 15
Goodyear Tire & Rubber Co. of Canada, Ltd.	Pfd.	0.50 q.	Jan. 31	Jan. 10
Gro-Cord Rubber Co.	Com.	0.10	Dec. 28	Dec. 17
Lee Rubber & Tire Corp.	Cap.	0.50 q.	Feb. 1	Jan. 20
Thermoid Co.	Pfd.	0.62½ q.	Feb. 1	Jan. 20
Union Asbestos & Rubber Co.	Com.	0.25 q.	Apr. 2	Mar. 10

United States Rubber Statistics—October, 1948

(All Figures in Long Tons, Dry Weight)

	New Supply			Distribution		Month-End Stocks
	Production	Imports	Total	Consumption	Exports	
Natural rubber, total	0	58,299	58,299	47,211	675	106,761
Latex, total	0	2,728	2,728	2,406	0	11,426
Natural rubber and latex, total	0	61,027	61,027	49,617	675	118,187
Synthetic rubber, total	*39,247 †2,172	2,014	43,433	38,367	451	102,854
GR-S	*30,681 † 467	1,266	32,414	29,122	69	87,380
Butyl	* 6,017	748	6,765	5,151	0	7,960
Neoprene	* 2,549 † 728	0	3,277	3,183	300	5,175
Nitrile	† 977	0	977	911	82	2,339
Natural rubber and latex, and synthetic rubber, total	41,419	63,041	104,460	87,984	1,126	221,041
Reclaimed rubber, total	23,859	0	23,859	23,512	848	31,879
GRAND TOTALS	65,278	63,041	128,319	111,496	1,974	252,920

*Government plant production.
†Private plant production.
‡Includes 12 tons shipped for export, but not cleared.
SOURCE: Rubber Division, ODC, United States Department of Commerce, Washington, D. C.

Financial

The Armstrong Rubber Co., West Haven, Conn., and Lake Shore Tire & Rubber Co., wholly owned subsidiary. Year ended September 30, 1948: net earnings, $1,097,930, against $1,957,271 in the preceding fiscal year; net sales, $33,297,908, against $34,163,090; provision for federal income taxes, $936,818, against $1,198,530; current assets, $14,265,481, current liabilities, $6,545,518, against $13,974,348 and $6,469,977, respectively, on September 30, 1947.

Dow Chemical Co., Midland, Mich., and subsidiaries. Six months ended November 30, 1948: net profit, $14,467,722, equal to $2.64 each on 4,994,824 common shares, against $9,096,337, or $1.61 a share, in the 1947 period; federal tax provision, $9,230,761, against $5,681,712.

Lee Rubber & Tire Corp., Conshohocken, Pa., and subsidiary: Year ended October 31, 1948: net income, $1,990,741, equal to $7.87 a share contrasted with $2,402,305, or $9.47 a share, in the preceding fiscal year: net sales, $35,702,493, against $37,197,883.

A. G. Spalding & Bros., Inc., New York, N. Y., and subsidiaries. Year ended October 31, 1948: net income, $1,536,403, equal to $2.95 each on 520,575 common shares, contrasted with $2,178,902, or $4.18 a share, in the preceding fiscal year; net sales, $23,359,034, against $24,242,499; income taxes, $849,546, against $1,739,650; current assets, $11,835,959, against $13,555,427; current liabilities, $2,631,813, against $4,443,224.

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WANTED—TECHNICAL MAN, VERSATILE, RUBBER AND plastics experience. North Jersey. Address Box No. 286, care of INDIA RUBBER WORLD.

RUBBER CHEMIST—MUST BE FULLY VERSED IN THE PROBlems of compounding natural and synthetic rubber, for plant in western Pennsylvania making a specialty of made-to-order molded goods, wrapped goods and roll coverings, and factory control of stocks through production. State full qualifications, references, wages required, etc., in your reply. Address Box No. 287, care of INDIA RUBBER WORLD.

TIRE DEVELOPMENT ENGINEER OPENING WITH EXCEPtional opportunity for young man who has experience in tire design and tire development. Give full details first letter. Replies held in full confidence. Address Box No. 291, care of INDIA RUBBER WORLD.

GRINDING WHEEL RESINS. RELIABLE MANUFACTURER will make salary or commission arrangement if preferred on a permanent basis with Resin man experienced in selling to the Grinding Wheel Trade. Our present representatives have been notified about this advertisement. Address Box No. 296, care of INDIA RUBBER WORLD.

Where Needs Are Filled

The Classified Ad Columns of INDIA RUBBER WORLD bring prompt results at low cost.

SITUATIONS WANTED

CONSULTING CHEMIST AND ENGINEER WITH TWENTY years' rubber and plastics experience in compounding, product development, research, testing, quality control, management, cost reduction, processing and production streamlining. Available one or two days per week. Chicago area. Address Box No. 283, care of INDIA RUBBER WORLD.

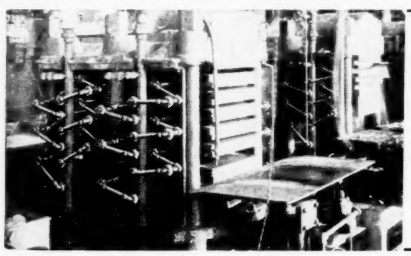
PRODUCTION SUPERVISOR WITH FIFTEEN YEARS' EXPERIence in mill room and press room: Banbury, mill mixing, calendering, extruding, molding. Trouble shooter for sponge and gas balls, also housewares. Can supervise roll building. Age 39, married. Address Box No. 284, care of INDIA RUBBER WORLD.

CHEMICAL ENGINEER WITH OVER FIVE YEARS' EXPERIence in rubber technology—principally wire insulation—desires new position with supervision or technical responsibilities. Age 30. Married. Present salary, $4,680. Address Box No. 285, care of INDIA RUBBER WORLD.

SALES-DEVELOPMENT ENGINEER, M.E., NOW EMPLOYED BY leading firm. Varied Detroit contacts, 10 years' synthetic and natural rubber, automotive mechanical goods, laboratory research evaluation, plastics. Metropolitan New York preferred—will travel. Address Box No. 289, care of INDIA RUBBER WORLD.

ADHESIVES AND ADHESIVE TAPE FOREMAN, SKILLED IN lab. and factory technique. Adhesives on paper, sheeting, scotch tape. Calendered plastic. Able to look into the eye of any coating problem and solve it, whether the difficulty is due to compounding or to machine. Address Box No. 290, care of INDIA RUBBER WORLD.

GRANULATED CORK
FOR EXTENDING RUBBER
SOUTHLAND CORK COMPANY
P. O. BOX 868 NORFOLK, VA.



FLEXO JOINTS
for SAFETY • DEPENDABILITY

TYPE "F"

Years of safe and economical service have proven the value of dependable Flexo Joints — wherever swing joints are needed. Available in four styles, for all standard pipe sizes from ¼" to 3".

FLEXO SUPPLY CO. 4651 PAGE BLVD. ST. LOUIS 13, MO. • In Canada — S. A. ARMSTRONG, Ltd. 115 Dupont St., Toronto 5, Ontario

QUALITY **INTEGRITY** **SERVICE**
68 YEARS WITHOUT REORGANIZATION

BELTING
Transmission—Conveyor—Elevator

HOSE
for every purpose
Water—Fire—Air—Steam

HOME RUBBER CO. TRENTON, N. J. STEAM NEVER BURN BLOW OUT PACKING CHICAGO NEW YORK

PACKING
Sheet & Rod Packings
for every condition

Mechanical Specialties of Every Description

HOME RUBBER COMPANY
Factory & Main Office
TRENTON 5, N. J.

LONDON: 107 Clifton St., Finsbury **CHICAGO: 168 North Clinton St.** **NEW YORK: 80-82 Reade St.**

(Classified Advertisements Continued on page 667)

United States Imports, Exports, and Reexports of Crude and Manufactured Rubber

Exports of Domestic Merchandise

	October, 1948	
	Quantity	Value
UNMANUFACTURED, Lbs.		
Crude rubber	10,000	$3,400
Balata	17,473	15,365
Chicle	9,389	34,496
Synthetic rubbers: GR-S	155,118	35,057
Neoprene	672,528	222,640
Nitrile	184,556	71,824
"Thiokol"	600	306
Polyisobutylene	6,910	2,305
Other, except Butyl	3,736	1,853
Reclaimed rubber	1,899,472	154,452
Scrap rubber	1,527,524	55,926
TOTALS	4,568,306	$597,624
MANUFACTURED		
Rubber cement *gals.*	53,510	$72,875
Rubberized fabric: auto. cloth *sq. yds.*	231,445	130,054
Piece goods and hospital sheeting *sq. yds.*	76,602	62,567
Rubber footwear:		
Boots *prs.*	15,521	73,685
Shoes *prs.*	7,556	14,316
Rubber-soled canvas shoes *prs.*	102,558	175,181
Soles *doz. prs.*	21,821	57,196
Heels *doz. prs.*	48,935	42,924
Rubber soling and top lift sheets *lbs.*	78,378	25,420
Gloves and mittens *doz. prs.*	13,677	46,280
Drug sundries: water bottles and fountain syringes *no.*	24,316	15,048
Other		178,870
Rubber and rubberized clothing		92,787
Balloons		137,738
Toys and balls		68,858
Bathing caps *doz.*	645	2,459
Rubber bands *lbs.*	2,447	1,465
Erasers *lbs.*	17,212	12,614
Hard rubber goods: battery boxes *no.*	35,986	51,704
Other electrical goods *lbs.*	119,468	52,498
Combs, finished *doz.*	6,606	6,888
Other		14,752
Tire casings: truck and bus *no.*	87,895	3,914,855
Auto *no.*	37,385	538,924
Inner tubes: auto, truck, and bus *no.*	85,045	283,972
Other casings and tubes, except auto *no.*	86,473	1,616,870
Solid tires: auto and truck *no.*	6,042	151,910
Other *lbs.*	73,339	41,726
Tire repair materials: camelback *lbs.*	66,663	20,497
Other *lbs.*	132,252	63,837
Rubber and friction tape *lbs.*	50,014	33,405
Belting: auto fan belts *lbs.*	60,810	72,325
Other *lbs.*	943,226	854,417
Rubber hose and tubing: garden hose *lbs.*	29,316	11,863
Other *lbs.*	528,039	447,108
Rubber packing *lbs.*	167,010	128,512
Mats, flooring, tiling *lbs.*	726,145	181,545
Thread: bare *lbs.*	40,715	65,015
Textile covered *lbs.*	22,922	48,372
Gutta percha manufactures *lbs.*	4,241	6,801
Latex and other compounded rubber for further manufacture *lbs.*	426,736	141,592
Other rubber products		301,214
TOTALS		$10,257,348
GRAND TOTALS, ALL RUBBER EXPORTS		$10,854,972

Reexports of Foreign Merchandise

UNMANUFACTURED, Lbs.		
Crude rubber	1,562,962	$320,570
Balata	15,680	5,533
Jelutong and gutta percha	67,760	22,125
TOTALS	1,646,402	$348,228
MANUFACTURED		
Rubber soling and toplift sheets *lbs.*	1,287	$735
Drug sundries: syringes and hot water bottles *no.*	720	210
Other		6,124
Rubber toys and balls		996
Erasers *lbs.*	750	144
Rubber packing *lbs.*	258	152
Mats, flooring, tiling *lbs.*	350	247
TOTALS		$8,608
GRAND TOTALS, ALL RUBBER REEXPORTS		$356,836

Imports for Consumption of Crude and Manufactured Rubber

	October, 1948	
	Quantity	Value
UNMANUFACTURED, Lbs.		
Crude rubber	130,591,223	$26,161,356
Rubber latex	6,109,755	1,578,419
Balata	185,254	67,726
Jelutong or Pontianak	324,573	181,424
Chicle	472,680	358,699
Synthetic rubber	4,511,440	851,219
Scrap rubber	1,159,937	25,175
TOTALS	143,354,862	$29,224,008
MANUFACTURED		
Tires: auto, bus, truck *no.*	43	$308
Bicycle *no.*	120	459
Inner tubes *no.*	10	27
Rubber footwear: boots *prs.*	5,719	8,270
Shoes and overshoes *prs.*	25,515	17,154
Rubber-soled canvas shoes *prs.*	947	2,881
Rubber balls: golf *no.*	5,136	2,070
Tennis *no.*	288	97
Other *no.*	81,960	8,960
Rubber toys, except balloons		803
Hard rubber products		1,762
Rubberized printing blankets *lbs.*	1,629	2,732
Rubber and cotton packing *lbs.*	1,838	2,502
Gaskets and valve packing		136
Molded rubber insulators		303
Rubber belting *lbs.*	4,922	6,893
Instruments *doz.*	94	157
Heels and soles *lbs.*	371	95
Soft rubber goods, except drug sundries		17,153
Other rubber products		387
TOTALS		$73,239
GRAND TOTALS, ALL RUBBER IMPORTS		$29,297,247

SOURCE: Bureau of Census, United States Department of Commerce, Washington, D. C.

Rims Approved and Branded by The Tire & Rim Association, Inc.

RIM SIZE	Dec., 1948
15° & 16° D. C. Passenger	
15x3.50D	8,080
16x4.00E	124,681
16x4.50E	174,508
15x5.00E	173,495
15x5.00F	965
16x5.00F	26,025
15x5.50F	48,970
16x5.50F	21,249
16x4.00E—Hump	18,949
16x4.50—Hump	17,813
15x4½-K	78,126
16x4½-K	69,069
15x5-K	421,322
16x5-K	47,902
15x5½-K	169,398
15x6-L	130,138
16x6-L	5,219
15x6½-L	130,470
15x4½-K—Hump	247,004
15x5-K—Hump	143,675
15x5½-K—Hump	106,771
15x6-L—Hump	29,971
17° & Over	
19x2.15B	6,170
Truck-Bus	
17x4.33R	1,804
20x4.33R	6,204
17x5.0	23,420
18x5.0	13,750
20x5.0	28,957
20x5.00R	28,297
15x5.00S	935
20x5.00S	35,603
17x5.5	25,835
20x5.50S	958
24x5.50S	557
15x6.0	948
17x6.0	2,662
20x6.0	145,650
20x6.00S	69,881
20x6.00T	3,169
20x6.5	16,729
15x6.50T	925
20x6.50T	31,214
24x6.50T	796
20x7.0	15,961
20x7.00T	9,029
20x7.33V	6,634
20x7.5	7,187
22x7.5	1,922
20x7.50V—Flat Base	3,607
22x7.50V—Flat Base	3,493
20x8.0	952
22x8.0	1,080
24x8.0	882
20x8.00V	7,645
24x8.37V	2,453
24x9.00V	396
Semi D. C. Truck	
16x4.50E	25,446
15x5.50F	27,206
16x5.50F	33,481
Tractor & Implement	
12x2.50C	22,034
12x3.00D	29,321
15x3.00D	31,996
18x3.00D	3,721
19x3.00D	25,482
21x3.00D	3,145
36x3.00D	2,535
40x3.00D	187
16x4.25KA	1,778
20x4.50E	5,164
18x5.50F	18,681
20x5.50F	6,462
24x6.00S	268
36x6.00S	433
24x8.00T	6,201
28x8.00T	617
32x8.00T	479
36x8.00T	374
W6-24	4,609
W7-24	5,453
W7-36	1,013
W8-24	13,389
W8-24 H	2,858
W8-32	626
W8-36	8,349
W9-24	8,242
W9-28	25,112
W9-36	754
W9-38	2,668
W10-28	4,971
W10-38	3,865
W11-24	375
W11-26	2,848
W11-28	544
DW8-42	1,154
DW9-38	4,883
DW10-38	3,214
DW11-28	900
DW11-38	4,807
DW12-26	5,238
DW12-30	5,966
DW12-34	2,074
DW14-30	251
DW14-34	790
Industrial	
9x4.00E	101
10x5.00F	64
Earth Mover	
20x11.25	259
21x13.00	170
24x15.00	446
25x15.00	359
25x17.00	38
29x17.00	231
33x19.50	25
33x22.00	101
TOTAL	3,060,360

Foreign Trade Opportunities

The firms and individuals listed below have recently expressed their interest in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, Washington, D. C., or through its field offices, for $1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Import Opportunities

Brian R. Morris & Co., Ltd., 24 Victoria St., St. Albans, Herts., England: Seval carbon black (thermatomic black).

R. H. G. Mac Arthur & Co., Ltd., P. O. Box 296, Zwartenhovenbrugstraat 223, Paramaribo, Surinam: Surinam sheet balata.

Peninsular Merchants, Ltd., 90 Robinson Rd., Singapore: Malayan raw rubber.

Pradith Suvanapradip, representing Suvan Vanit Co., Ltd., 693 New Rd., Bangkok, Siam: rubber.

Export Opportunities

Casa Max Edelman, Casilla Correo No. 990, La Paz, Bolivia: used tires for automobiles and trucks.

LOS ANGELES A CALIFORNIA

OUR NEW MACHINERY
HYDRAULIC PRESSES
CUTTERS—LAB. MILLS
BRAKES—LIFT TABLES
MILLS—MIXERS
SUSAN GRINDERS

NEW MACHINERY REBUILT

OUR 5-POINT REBUILDING PROCESS
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2—DISASSEMBLY
3—REBUILDING
4—MODERNIZING
5—GUARANTEE

AKRON A OHIO

CHICAGO A ILLINOIS

L. ALBERT & SON
COAST-TO-COAST
TRENTON, N. J.—MAIN OFFICE

STOUGHTON A MASSACHUSETTS

CLASSIFIED ADVERTISEMENTS
Continued

MACHINERY & SUPPLIES FOR SALE

FOR SALE: 1 WATSON STILLMAN LOW AND HIGH HYDRO Pneumatic Accumulator (3000# pressure with pumps, motors, and accessories. 1—48" x 48" 3-opening Hydraulic Press with 4-16" rams; other presses, various sizes. 1—5" x 24" Vulcanizer, 100# pressure, quick-opening door. 6—Royle and other Tubers 2" to 8". Also mills, calenders, etc. Send us your inquiries. CONSOLIDATED PRODUCTS CO., INC., 15-16 PARK ROW, NEW YORK 7, NEW YORK. Telephone: BArclay 7-0600.

FOR SALE: FARREL 16" x 36", 2-ROLL RUBBER MILL. ALSO lab. size, 30", 36", 40", 42", 48", 60", 84" sizes: Rubber Calenders 30", 54", & 60"; Royle 2" perfected Extruder; Rubber Tubers 2" to 6"; Baker-Perkins 200-gal. & 100-gal. double-arm, jack. Mixers, also 50, 20, 9 & Lab. 0.7 gals.; large stock Hydraulic Presses from 12" x 12" to 42" x 48" platens, from 50 to 500 tons; Hydraulic Pumps and Accumulators; HPM 4-oz. Injection Molding Machine, other sizes 1 to 16 oz.; Stokes & Colton single punch & rotary preform Tablet Machines, ½" to 2"; Banbury Mixers; Rotary Cutters; Grinders & Crushers; Mixers; Pumps, Kettles, Tanks, etc. SEND FOR SPECIAL BULLETIN.
WE BUY YOUR SURPLUS MACHINERY
STEIN EQUIPMENT COMPANY
90 WEST STREET, NEW YORK 6, N. Y.

FOR SALE—ONE 16" x 48" FARREL-BIRMINGHAM TWO-ROLL mill with 50 h.p. motor and chain drive. Price reasonable. J. A. MacGregor, Devoe & Raynolds Co., Inc., Delancey & Rutherford Sts., Newark 5, New Jersey.

FOR SALE: FARREL 16" x 36", 2-ROLL RUBBER MILL. ALSO 2-Farrel-Birmingham 2-roll mills 16" x 42". All driven from 500 h.p. motor via reduction gear on one line shaft. **CHEMICAL & PROCESS MACHINERY CORPORATION**, 146 Grand Street, New York 13, N. Y. WOrth 4-8130.

FOR SALE COULTER AUTOMATIC SPECIAL VOLUMETRIC Cutting & Blanking Machine, Model A-3, 5½- to 10-inch strip width with adjustable stripping mechanism, Reeves Variable Speed Drive. With or without 5 H.P. motor. Machine never used. Direct inquiries to DANBURY RUBBER CO., INC., Danbury, Conn.

HOWE MACHINERY CO., INC.
30 GREGORY AVENUE PASSAIC, N. J.
Designers and Builders of
"V" BELT MANUFACTURING EQUIPMENT
Cord Latexing, Expanding Mandrels, Automatic Cutting, Skiving, Flipping and Roll Drive Wrapping Machines.
ENGINEERING FACILITIES FOR SPECIAL EQUIPMENT
Call or write.

An International Standard of Measurement for
Hardness • Elasticity
Plasticity of Rubber, etc.
Is the DUROMETER and ELASTOMETER (35TH YEAR)

These are all factors vital in the selection of raw material and the control of your processes to attain the required modern Standards of Quality in the Finished Product. Universally adopted.

It is economic extravagance to be without these instruments. Used free handed in any position or on Bench Stands, convenient, instant registrations, fool proof.

Ask for our Decriptive Bulletins R4, R5, and R6.

THE SHORE INSTRUMENT & MFG. CO.
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Agents in all foreign countries.

Economical **NEW** Efficient
Mills - Spreaders - Churns
Mixers - Hydraulic Presses
Calenders
...GUARANTEED...
Rebuilt Machinery for Rubber and Plastics
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AIR BAG BUFFING MACHINERY
STOCK SHELLS HOSE POLES
MANDRELS
NATIONAL SHERARDIZING & MACHINE CO.
868 WINDSOR ST. HARTFORD, CONN.
Representatives
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IMMEDIATE DELIVERIES FROM STOCK
MILLS, CALENDERS, TUBERS
VULCANIZERS, ACCUMULATORS
UNITED
HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS
UNITED RUBBER MACHINERY EXCHANGE
NEW ADDRESS: 183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

(Classified Advertisements Continued on page 668)

FOR SALE

INSULATED WIRE MANUFACTURING MACHINERY (USED)

1 — ⌀3 Banbury Mixer with Gear Reduction Unit and Motor

3 — 42" Mixing Mills complete with 1 Gear Reduction unit and 1-50 HP Motor

1 — 24" Mixing Mill

1 — ⌀2 John Royle Rubber Strainer

1 — ⌀4 National Erie Rubber Strainer

2 — 20 wire Rubber Strip Insulating machines, complete with rolls — motors, payoff & takeup stands (wire sizes 8 to 18 incl.)

1 — 6 Wire Rubber Strip Insulating machine, complete with rolls — Motors — and takeup stand for 6 Wires (wire sizes 1 to 6 incl.)

16 — Universal Leesona ⌀50 Winders (6 spindles each)

550 — N. E. Butt B6-16 Carrier Braiders, complete with Mossberg Carriers — capstans, payoff and individual takeup stands with mechanical traverse

25 — N. E. Butt B6-Double deck 20x24 carrier Braiders, complete with Butt Carriers, capstans, payoff and takeup stands

40 — N. E. Butt ⌀2 — 12x16x20 Carrier Braiders, complete with Butt Carriers, capstans, payoff and takeup stands

100 — N. E. Butt B6-16x16x20 Carrier Braiders, complete with Carriers, capstans, payoff and takeup stands

6 — N. E. Butt ⌀3 — 24x28x32 Carrier Braiders, complete with Butt Carriers and capstans

6 — N. E. Butt ⌀3 — 28x32 Carrier Braiders, complete with Butt Carriers and capstans

200 — Wardwell — High Frame 16 Carrier Braiders

2 — Horizontal Vulcanizers with quick opening door

6 — Double Side, High speed reel takeup stands, complete with payoffs — Sparking electrodes and Patch Vulcanizing Presses

1 — Terkelsen Large Coil Wrapping Machine with Motor (new)

10 — Lift trucks

250 — Hardwood Skids with metal legs

Also other miscellaneous machinery and reels too numerous to mention, used in the wire industry. Above equipment will be sold subject to Prior Sale — as is, where is and may be seen by appointment.

Apply Box ⌀282, Care of INDIA RUBBER WORLD.

LIQUIDATING Machinery

of Coated Fabrics Division of

ATLAS POWDER CO., STAMFORD, CONN.

Including: — 24x66" 3-roll Calender, herringbone geared throughout with Variable Speed Motor and controls; 60" Erie Mill with enclosed Reduction Drive, 125 HP Motor and controls, new 1948; Several other mills, 40" to 60". Royle ⌀3 and ⌀6. Strainers with drives and motors; Baker Perkins 100 gallon jacketed heavy duty double arm Mixer with 40 HP Motor; Sheridan Hydraulic Embossing Press, 26 x 54", Model 9AH; 7-Sheridan Toggle Type Embossing Press, 26" x 54"; 15 — Coating and Spreading Machines, 60" to 70" width, 30 to 90' long. Representative on premises. Send for complete list.

CONSOLIDATED PRODUCTS CO., INC.

P. O. BOX 1115 STAMFORD, CONNECTICUT

TELEPHONE — STAMFORD 3-2171

RUBBER MACHINERY

IS OUR BUSINESS

- Mills
- Calenders
- Presses
- Pumps
- Banburys
- Tubers
- Vulcanizers
- Grinders

Immediate Delivery — Good Equipment

Reasonable Prices—Each Installation Engineered

AKRON RUBBER MACHINERY CO.

P. O. Box 88 WA-0131 Akron, Ohio

CLASSIFIED ADVERTISEMENTS

Continued

MACHINERY & SUPPLIES FOR SALE (Cont'd)

RUBBER AND PLASTICS THROPP CALENDER, 3-ROLL, 16" x 6", surplus, in use; also Laboratory Mill. Address Box No. 294, care of INDIA RUBBER WORLD.

MACHINERY & SUPPLIES WANTED

WANTED: PLASTIC VINYL SCRAP, BLACK, ALL GAGES, clear and clear transparent in all colors. Top prices paid. Large quantities, carload lots. Address Box No. 288, care of INDIA RUBBER WORLD.

WANTED: 3-ROLL CALENDER, 18" x 48", 18" x 54", or 20" x 50", Herringbone gears. Good condition. No dealers. Address Box No. 292, care of INDIA RUBBER WORLD.

WANTED: (1) USED DOWN-STROKE HAND- OR MOTOR-driven press making approx. 32" x 25" x 15" size bale. Advise price, location, and full particulars. Address Box No. 293, care of INDIA RUBBER WORLD.

WANTED: LABORATORY-SIZE RUBBER OR PLASTIC MILL—used—but must be in good condition. Address Box No. 295, care of INDIA RUBBER WORLD.

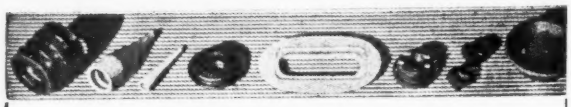
WANTED — Large engineering firm wishes to acquire several complete Rubber Plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment, whole or in part. Personnel retained where possible, strictest confidence. Box 1220, 1474 Broadway, New York 18, N. Y.

WANTED

Chemicals — Colors — Pigments
Resins — Solvents — Glues — Plasticizers
Other Raw Materials

CHEMICAL SERVICE CORPORATION

80 Beaver Street, New York 5 Hanover 2-6970



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FROM NATURAL, RECLAIMED, AND SYNTHETIC RUBBER

THE BARR RUBBER PRODUCTS CO. SANDUSKY OHIO

"ANNALS OF RUBBER"

A Chronological Record of the Important Events in the History of Rubber

50¢ per copy —

India RUBBER WORLD

386 FOURTH AVENUE
NEW YORK 16, N. Y.

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"They Last Longer" REG. U. S. PAT. OFF.

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DRESS SHIELD LININGS
BABY PANTS
BABY BIBS & APRONS
SANITARY WEAR
RUBBERIZED SHEETING
RUBBER APRONS
STOCKINET SHEETS
RUBBER SHEETS
RAINCAPES & COATS
RUBBER SPECIALTIES
DOLL PANTS, CAPES, ETC.

RUBBER DAM & BANDAGES — SHEET GUM

RAND RUBBER CO. BROOKLYN, N. Y. U. S. A. MFRS.

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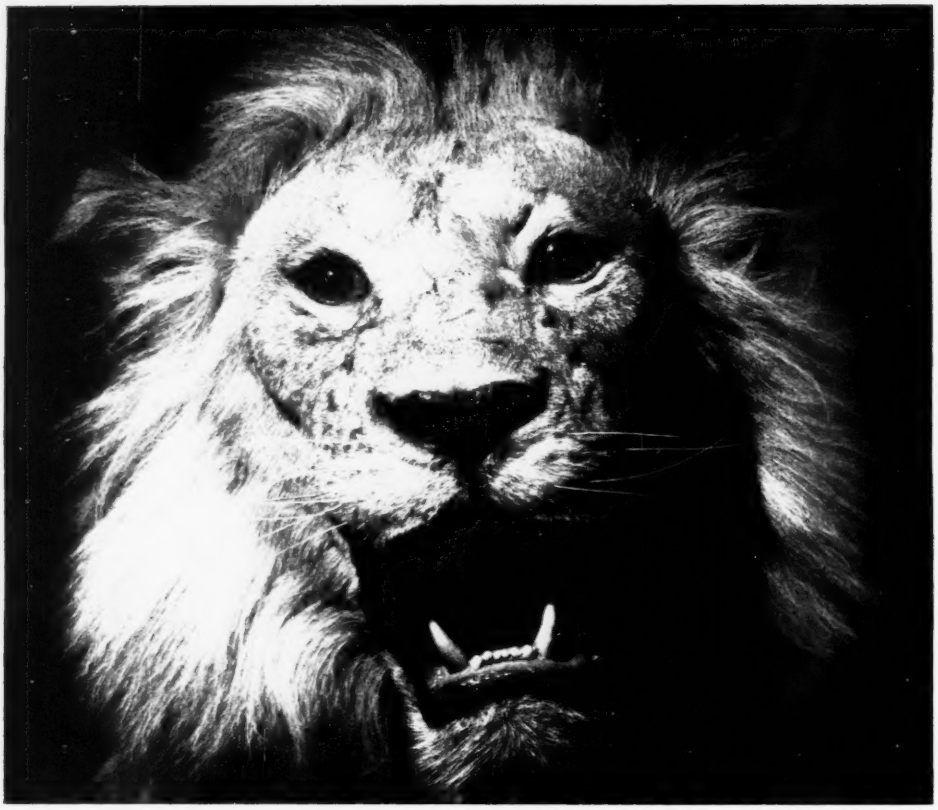

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